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The Graduate Record Examination as an Aid in the Selection of Medical Students*

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INTRODUCTION

It gives me great pleasure to address this conference, the first postwar educational conference that I have been privileged to attend. It is altogether fitting that the profession which has contributed most to the alleviation of human misery and suffering should be among the foremost in reconsidering its own educational problems. Now that the war has been concluded successfully, we can turn from the serious business of deliberate destruction to the equally serious business of constructive rehabilitation. In this latter process, graduate and professional education must play an important role. This conference is mute testimony that, as educators, you recognize the importance of this role and feel the need for mutual interchange of experiences in educational matters. It is a privilege to share this interchange with the members of this conference.

My purpose here is to discuss the Graduate Record Examination and to point out how its results can assist in the appraisal of applicants to the medical school.

It is well understood that the quality, standing, and importance of a profession depend largely upon the quality and competence of the men who engage in it. High caliber men make a profession notable; professional training does not necessarily make high caliber men. It follows, then, that any educational procedure, instrument, or device which can provide a discriminating basis for evaluating the quality of applicants for professional training merits serious consideration. Many have found the Graduate Record Examination helpful for this purpose.

HISTORICAL DEVELOPMENT

The Graduate Record Examination was inaugurated in 1936 as a research project in higher education by the deans of the graduate schools of Harvard, Yale, Princeton and Columbia Universities in collaboration with the Carnegie Foundation for the Advancement of Teaching. Believing that hitherto unused

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approaches to the problem of selecting graduate students might be helpful, the deans of these graduate schools sponsored the early experimental work. The results of these early studies were so promising that the experimental use of the examination was extended to a much larger group of graduate institutions, and still further experimentation was conducted in a number of undergraduate colleges. By 1942, the examination had been administered to approximately 30,000 students, including college sophomores, juniors, seniors and graduate students.

In 1943, acting upon the recommendation of a committee of graduate deans, the Carnegie Foundation undertook to sponsor the examination on a national basis. The success of this undertaking is reflected in the fact that forty-three graduate and professional schools now require the examination of specified groups of candidates; and sixty-two other schools of this class recommend that candidates submit the test results as an auxiliary credential for admission. Of these 105 institutions, four are located in Canada. Although the use of the tests for schools of medicine and law in a recent proposal, seventeen medical (one dental) schools and six law schools already are included in this group.

Among undergraduate colleges, thirteen such divisions associated with the graduate or professional schools already mentioned, and thirty-two others gave the examination as a collegiate requirement during the past fiscal year to 5,322 students, chiefly seniors. During the same period, 1,213 independent students from various sources took the examination for admission to graduate schools which required it. For this latter purpose, ninety-one other institutions, chiefly undergraduate, appointed permanent official examiners who serve as supervisors of local centers where the tests can be given regularly. Thus, at some 225 independent stations throughout the country, a group of 6,535 advanced college students were examined during the year, bringing the total of those who have taken the present form of the Graduate Record Examination to more than 45,000.

Early in 1944, the Carnegie Foundation embarked upon the complicated and expensive undertaking of providing the examination to applicants in any part of the United States. By adopting the policy of testing students anywhere and at almost any time, the examination attempted to serve its ever growing list of cooperating graduate and professional schools which either require or invite applicants to present results of the examination.

The procedures whereby this general policy has been implemented may be summarized as follows: first, subscribing graduate or professional schools announce in their catalogs and in communications with applicants that the examination results, if presented, will be regarded as valuable evidence of fitness for admission. A graduate or professional school may require the test results or not as it sees fit. Secondly, the institutions which thus sanction the examination for any purpose appoint an officer who receives the examination results and interprets them according to the policies of the institution. To this officer, the Graduate Record Examination furnishes a file of accumulated results with the necessary explanations. Thirdly, all or most of the institutions supporting the examination eventually become centers where the tests may be given. That is,

any university would maintain one center serving all its parts. When the Graduate Record Office requests special administrations of the test, this is an independent function to which the insitution at most contributes the overhead, the use of its bulletin boards, and its good will. In such cases, all operating expenses are arranged with local personnel and borne by the examination. An Examination Center, nevertheless, constitutes a convenient going concern available to any part of an institution for its own educational purposes.

The Graduate Record Office serves as the central agency for distributing, receiving, scoring and reporting the test results and where the many other functions of the project operate. This remains for the present only in New York City. It is intended, nevertheless, that the examination, in so far as possible, be of local concern. Colleges and universities using the examination for institutional purposes are encouraged to develop a well trained staff devoting part time to the interpretation of the test results and student guidance. In centers where the examination results are not used locally, it is provided for any applicant either at his own college or, in case he is not enrolled in college and no center is nearby, at his home town, provided such arrangements can be made with a qualified and trustworthy examiner.

The essential purpose of these arrangements is to facilitate access to the examination on the part of individual applicants and to assist the cooperating graduate and professional schools with their appraisal of applicants from many remote parts of the country.

During the past year, we have attempted to test all applicants within a reasonable time at a center which is convenient to them. Our experience has been most valuable, and it is on the basis of this experience that we are now arranging for the examination to be conducted on fixed dates throughout the country at least four times each year, and more often only if the need for it can be shown. At new centers for which arrangements must be negotiated, the applicant, in some cases, is obliged to wait from one to two months from the date of application. Under the proposed four-times-per-year schedule, the student will be notified of the dates when the next regularly scheduled examinations are conducted at his nearest center, or of scheduled dates at neighboring institutions. If, however, the student must be examined before any regularly scheduled administration in his general locality, he can be declared an emergency case and be tested promptly at a center specially established for him.

The endorsement received during this developmental period makes it clear that the examination fulfills a useful purpose and is especially valuable to the individual and the institution when its results can be had well in advance of the student's admission to the successive stages of his graduate and professional study.

THE TESTS IN THE EXAMINATION

The administration of the examination is, of course, only a mechanism whereby it is made available to students and to cooperating institutions. It is of first importance that its users understand clearly the nature and purposes of the individual tests included in the examination. The examination itself is a series

of comprehensive tests designed to show the nature and extent of an advanced student's actual equipment in knowledge—however this knowledge may have been acquired—in comparison with groups having similar interests and training. The tests cover broadly the principal subjects of a liberal education. The Profile tests, that is, the tests which are required of all applicants regardless of what has been studied, consist of mathematics, physics, chemistry, biology, social studies (history, government and economics), literature, fine arts and a general vocabulary test. In addition, each student selects one or more advanced tests in his major field of study. Thus the customary unit of examination consists of eight tests of general educational development and one special advanced examination in the subject or area of major concentration.

Essentially tests of achievement in broad areas of study, the several tests in the series are required to conform to the best examination standards. In the first place, all the tests now in general use were prepared under the supervision of scholars from the faculties of several universities. Consequently, they do not follow the curriculum at any one institution. Constructed to measure important outcomes of the educational process, the tests are adjusted to accommodate the great range of achievement characteristic of advanced college students. With appropriateness and usefulness thus insured, the individual tests must then run the gauntlet of the most rigorous technical standards. Since the test results are intended to be used in the guidance of individual students, unusual dependability of scores is required. Furthermore, their validity for purposes of prediction is carefully investigated, and, from time to time, the tests are revised in light of these research findings.

Scores on the examination possess at least two distinct advantages. Of great significance is the fact that they have but one meaning; they represent the relative standing of the student with respect to his knowledge of the subject areas tested. They are the result of his ability to answer questions, solve problems, and to exercise judgment based on knowledge of the special field of study. A second feature of the scores is their strict comparability. Reported in terms of standard scores, a student's performance in one subject area may be compared directly with his performance in the other areas or subjects tested. Furthermore, the performance of individuals and groups of students can be compared with meaningful standards for special student groups with a maximum of ease and clarity.

Obviously, an examination concerned with testing the student's command of basic subject matter cannot at the same time test all other valuable outcomes of his college studies and experiences. Abilities such as creativeness, expertness in laboratory techniques, research ability, originality, as well as personal qualities and attributes, are separate elements which must be defined and described by other means. Appraisal of these qualities is the function of competent observers who understand the methods of individual appraisal and who make it their business to study the student.

SOME SAMPLE EXAMINATION RESULTS

Once the nature and the limitations of the various tests in the examination are clearly understood and appreciated, the primary basis for interpretation of

INDIVIDUAL REPORT CHART OF A PREMEDICAL STUDENT.

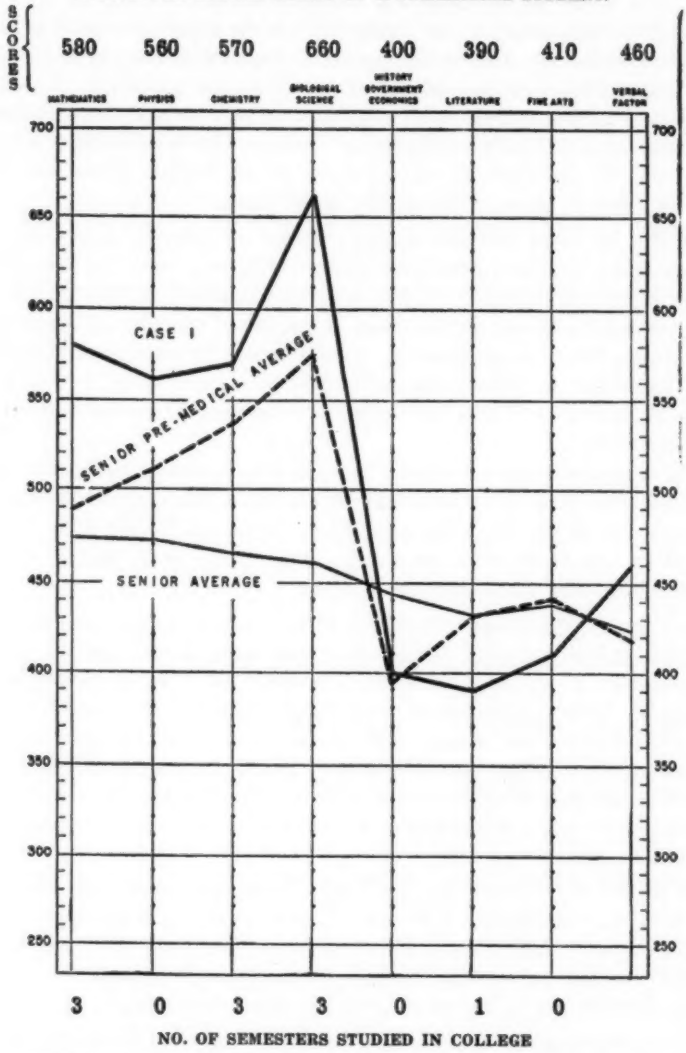

FIGURE 1.—REPORT CHART OF P. WESTON WHO MAJORED IN BIOLOGY.

the examination results is established. There are, however, certain technical considerations involved in the reporting of test performance which may be profit-

ably considered here. To illustrate the method of reporting scores on the examination, a reduced copy of a portion of the Individual Report Chart of Student Weston is presented herewith (Fig. 1).

We have here the actual report of a premedical student examined in May, 1943. His major field of study was biology which was the subject of his Advanced Test. His record on the Profile Tests is the heavy unbroken line having intersections corresponding to the test scores reported at the top of the chart. The broken line is the average record for all college senior men who intend to apply to medical colleges upon completion of their college study, and represents the norm with which this student's record may best be compared. The light solid line indicates the average scores for all Eastern liberal arts senior men regardless of major subject or vocational goal.

It will be noted that this student's scores are generally higher than the average scores for those premedical students who have taken the examination, except in the socio-humanistic fields. Actually, the difference between his average score and the average of this group of premedical students is 34 scale points in his favor. When compared with the same group, 94 per cent of all students were below him in biology, his major field of study. In the Verbal Factor Test, his score of 460 was better than the scores of 73 per cent of all premedical students.

His scores in literature and fine arts are below average, but this is understandable when it is appreciated that he has taken only one college course in literature and no courses in fine arts. In the Advanced Biology Test, his score in zoology was at the 65th percentile and his botany score was at the 70th pencentile of scores for premedical students.

At the time this record was taken, Weston was a college sophomore, aged 18. This explains the small number of courses taken in each field as recorded at the bottom of the chart. These facts, however, serve to emphasize the general quality of the student and to reveal his competence in fields which have not been studied formally in college. With this test record and the supporting facts, a guidance officer might expect Weston to possess the general educational development necessary to success in the medical school. To test this hypothesis, let us consider Weston's educational experiences since this test performance was recorded.

At the end of his junior year in college, Weston was drafted and, after Army basic training, was assigned to an A.S.T.P. medical unit at a prominent medical school. While pursuing his A.S.T.P. courses, he completed the formal requirements of his undergraduate college and was subsequently granted the A.B. degree in absentia. Later, he was assigned to active duty abroad.

It is interesting to speculate just what has happened to the intellectual equipment of this student upon his return to civilian life. The above record indicates great promise in the scientific fields, but this promise should be confirmed at the time of reconsideration of his pending application for medical study. A repetition of the Graduate Record Examination upon his return to

civilian life is essential to clarify Weston's present educational status. Certainly, a second administration of the examination would reveal whatever growth or forgetting has occurred. Many admission committees would be particularly interested in the extent to which Weston has removed the deficiency depicted on the right side of the Report Chart.

With this introduction to the interpretation of the examination results, it may be helpful to consider some test results typical of premedical students in general. Frequently, group test results can supply important information which cannot be deduced from a series of individual test reports. The test technician recognizes what are sometimes called "vocational or occupational families," that

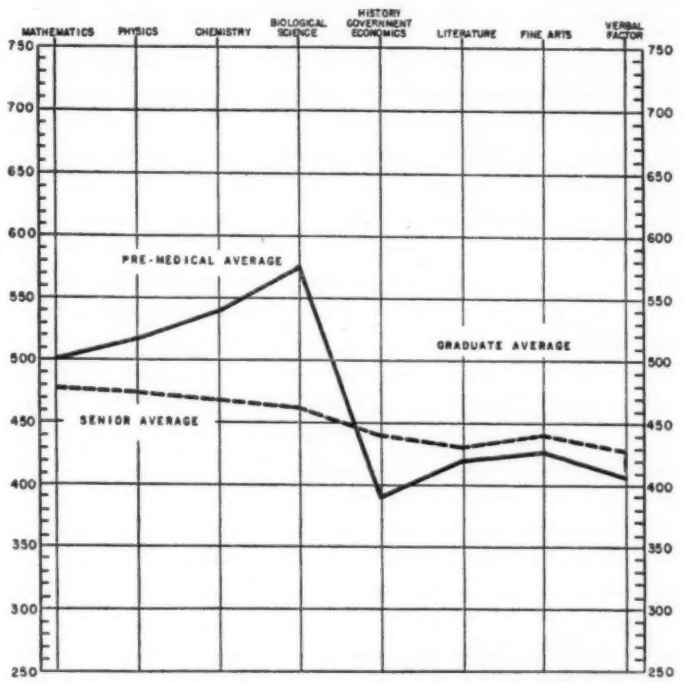

FIGURE 2.—AVERAGE PROFILE TEST SCORES FOR 676 MALE PREMEDICAL STUDENTS TESTED DURING 1945.

is, groups of students of similar interests and goals whose test performance conforms to a fairly uniform pattern. Such a pattern is revealed in Figures 2 and 3 which present average test scores for a large group of premedical students and indicate roughly the range of these scores along the scale.

As an essential step in a comprehensive study of the test performance of premedical students now in process by the Examination Staff, the test papers for 676 premedical students tested during the past several months were analyzed. This group included both undergraduate and graduate students, but represents

a fair sample of the total group tested. The mean scores for the sample are shown in Figure 2. The most striking revelation to the Staff was that these average test scores are almost exactly the same average scores obtained by a similar group tested several years ago. The same characteristic pattern is revealed. Thus, it is reasonable to assume that the average profile of premedical students today approximates that shown in Figure 2.

If this group is typical of premedical students in general, and there is good reason to assume that it is, some pertinent generalizations may be ventured. It is apparent that this group of premedical students is well above the senior average

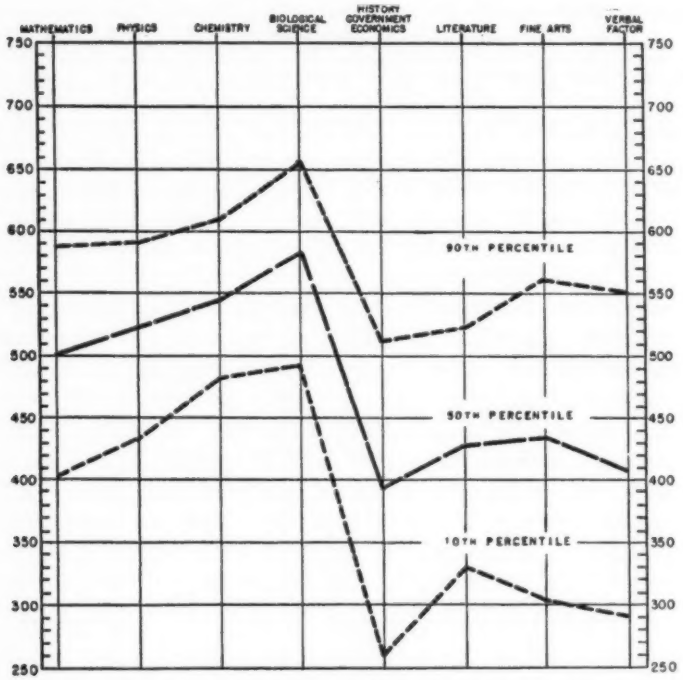

FIGURE 3.—MEDIAN PROFILE TEST SCORES AND SCORES AT THE 90TH AND THE 10TH PERCENTILES.

in all scientific subjects and somewhat below in the so-called socio-humanistic subjects. Furthermore, in all scientific subjects, the average scores exceed those of first-year graduate students in Eastern liberal arts colleges. This conforms to expectation, since premedical curricula have characteristically emphasized the scientific subjects. It is interesting to note, however, that this superiority in science of premedical students to the first year graduate average is far less than is their inferiority to this average in social studies, literature and fine arts. This is partly due to the weighting of this graduate average with larger numbers of majors in non-scientific subjects.

Recognizing that the term premedical student is used here to indicate a student whose vocational goal is medicine rather than students accepted by medical colleges, the situation in this respect may not be quite so disturbing as it appears at first glance. Consider Figure 3 in which the distributions of scores of would be medical students are indicated roughly by the 10th and 90th

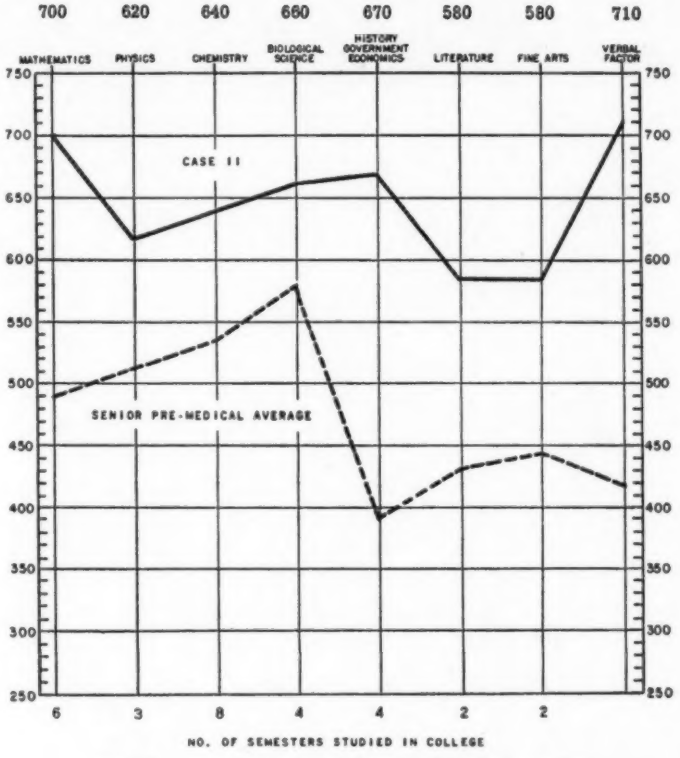

FIGURE 4.—CASE II: SENIOR, AGE 20 WHEN TESTED.

Major Field: Chemistry — Vocational Goal: Medicine

Test Scores:

Profile Chemistry: 97th percentile (S, P-M)*
Advanced Chemistry: 95th percentile (S, P-M)

Superior performance in all subjects; stands in upper three per cent of senior premedical students in all subjects tested. Extraordinarily well-balanced program of college study.

*These percentiles are based on scores for Eastern Liberal Arts Seniors whose vocational choice was medicine, hereinafter abbreviated S, P-M.

percentiles. It can be determined from this figure that the average score for the student uniformly at the 90th percentile is 560. In other words, 10 per cent of all medical school applicants are likely to exceed this average score. Such a showing is indeed a creditable one, when we consider that many students are admitted to medical school before graduation from college.

Figure 3 also indicates a fact which is undoubtedly well known to most medical school officers. Beginning medical students are more homogeneous with respect to their achievement in the scientific subjects than they are with respect to achievement in socio-humanistic fields. Among premedical students, competence in chemistry and biological science is more apt to be a common de-

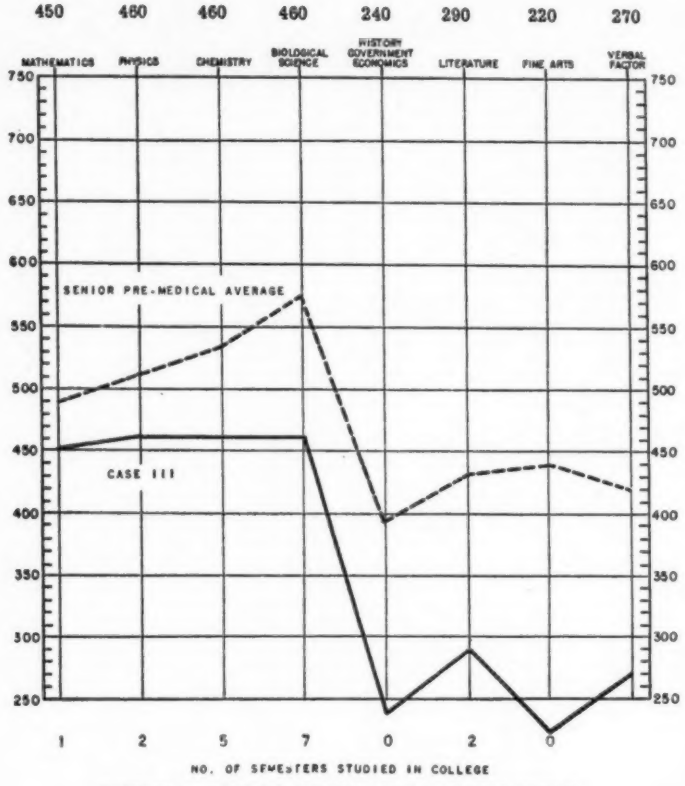

FIGURE 5.—CASE III: SENIOR, AGE 19 WHEN TESTED.

Major Field: Biology **Vocational Goal: Medicine**

Test Scores:
Profile Biology: 3rd percentile (S, P-M)
Advanced Biology: Zoology, 5th percentile; Botany, 5th percentile (S, P-M)

Well below the average of senior premedical students in mathematics and scientific subjects. In lowest one per cent of senior premedical students in other subjects not studied in college.

nominator than a well developed background in literature and social science. It can be shown that among the present group of premedical students, certain individuals are much better prepared in the socio-humanistic fields than many students who have specialized in these subjects. It can be shown also that certain of the students from this same group have such low test performance in these areas that their record must be indicated below the scores obtained by the

lowest 1 per cent of all students to take the Graduate Record Examination. These striking differences in student quality are illustrated by Cases II and III. (Figures 4 and 5.)

Case II is obviously a well rounded student whose achievement is well distributed. His pattern of study reveals systematic sampling of all of the major

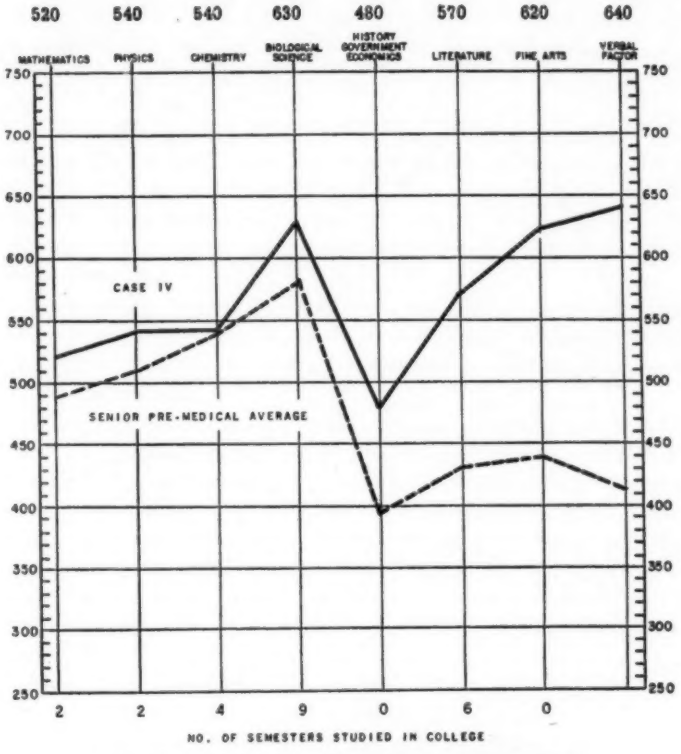

FIGURE 6.—CASE IV: JUNIOR, AGE 19 WHEN TESTED.

Major Field: Biology **Vocational Goal: Medicine**

Test Scores:

Profile Biology: 75th percentile (S, P-M)

Advanced Literature: 79th percentile (Senior majors in English Literature, Eastern Liberal Arts Colleges)

Above average of senior premedical students in all subjects except chemistry. College record indicates concentration on scientific subjects, language and literature; no courses in fine arts or social studies.

fields of learning and his achievement in each of these fields is outstanding. In direct contrast, Case III exhibits a spotty pattern of study and uniformly inferior achievement. It is surprising that a student whose academic record and achievement pattern is such as that revealed here would aspire to the medical profession. Misguided, as he apparently is, Case III could hardly expect to succeed in any medical school. To the experienced user of the Graduate Record Examination

results, both applicants would be clear-cut cases. If all other factors concerning Case II are equally favorable, any medical school could admit this student without question. With respect to Case III, however, few, if any, medical schools would consider this applicant worthy of admission however favorable his personal qualities may appear.

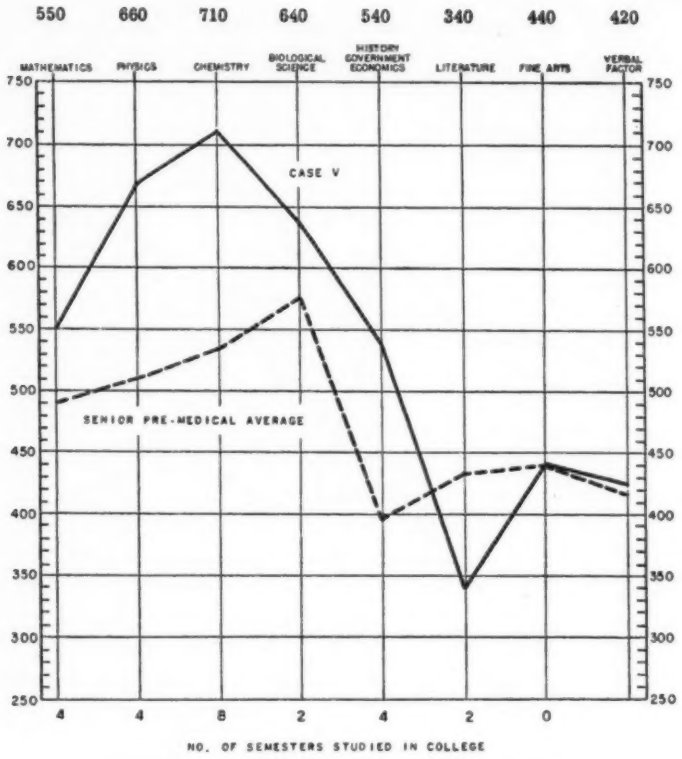

FIGURE 7.—CASE V: SENIOR, AGE 25 WHEN TESTED.

Major Field: Chemistry **Vocational Goal: Medicine**

Test Scores:
Profile Chemistry: 99th percentile (S, P-M)
Advanced Chemistry: 95th percentile (S, P-M)

Outstanding performance in chemistry. Well above the average of senior premedical students in mathematics, biology and social studies. Below the average in literature. Fairly typical premedical program of college study.

Cases IV and V following, being more typical of medical school applicants in general, must be appraised more carefully. Here, as in the case of Weston, the objective evidence provided by the examination must be related to subjective estimates of student quality to a greater extent than in Cases II and III. In the acceptance or rejection of such candidates, the examination can provide no more than an objective and dependable measure of the applicant's breadth

and depth of knowledge in the major fields of learning. This is highly important. But the applicant's general educational development in these fields is only one of the several factors that must be considered in selecting medical students. The examination reveals the quality of the educational status; its users must appraise the applicant in light of additional criteria as well as the policies and standards established by the institution. It is not, therefore, possible or desirable to conclude that either Case IV or Case V should be selected or rejected on the basis of their examination results alone. It is suggested, however, that admission committees would find this objective evidence valuable in verifying the quality of such applicants.

Admission officers and committees experienced in the use of the Graduate Record Examination results have found many ways to use the test record in connection with other evidences of an applicant's educational echievements. The college transcript is the evidence customarily submitted by applicants. Consider the following ways in which examination results can supplement evidence supplied by college transcripts.

1. Many college transcripts submitted to admission committees appear to indicate superior achievement in all areas studied. The Graduate Record Examination can be used to corroborate superiority in comparison with students from other institutions.

2. College transcripts from several institutions generally cannot be considered on the same basis, and frequently, there is but little comparability between marks assigned by different professors within the same institution. Recognizing the relative and highly unreliable character of course marks, it is apparent that some basis of comparability is imperative. Examination results provide measures which are strictly comparable with each other and with a wide variety of discriminating standards. Scores for applicants to medical school take on real meaning when they can be expressed in relation to large groups of students aspiring to the medical profession.

3. Some college transcripts appear to indicate average or below average achievement whereas other personal appraisals of the applicant are more favorable. In this case, examination scores can provide supplementary evidence for accepting or rejecting the applicant. In some cases, the applicant's preparation is much better than the transcript indicates; in other cases, the transcript may present a much too favorable record.

4. Frequently, college transcripts are confused by numerous transfers or ambiguous marking systems. In such cases, the examination results can serve to clarify the applicant's status.

5. College transcripts provide no indication of competence in fields not formally studied in college. The examination provides a trustworthy index of the applicant's competence in all areas represented in the Profile Tests. In some cases, the results reveal broad competence in fields not formally studied, thus indicating a mind independent of formal "courses" or exceptionally retentive of concepts acquired in the secondary school; in other cases, serious deficiencies are revealed.

6. Perhaps of greatest immediate significance, in view of present conditions, the examination takes account of the continued educational development of those whose formal program of study has been interrupted. For some applicants, the results of two or three years of formal course-taking may have evaporated; for others, an active mind may have greatly increased its resources during this time.

SOME GENERAL CONSIDERATIONS

The foregoing discussion has dealt with only one aspect of the applicant's fitness for the study of medicine—that of his general educational preparation at the time of application. It is recognized that this aspect of quality is only one of the several factors which must be considered by the medical school admission committee. By concerning itself primarily with measuring the educational status of applicants, the examination cannot be expected to provide measures of the many complex attributes necessary to success in the medical school and finally in the medical profession. It does, however, assay one of the important prerequisites of professional study.

The examination is not designed to yield scores particularly predictive of success in medical school; it cannot therefore be characterized as an aptitude test. Whereas the typical aptitude test is designed to yield a single score highly predictive of success in a given activity, the examination derives a minimum of eight scores and reveals differential achievement. Scores on the examination are predictive in character, but their predictive value results from the fact that the tests measure general competence in broad fields of study—a competence which is itself predictive of success in further work and study. As I understand it, the purpose of the Medical Aptitude Test is to derive an index highly indicative of scholastic success in the medical school. The Graduate Record Examination, on the other hand, has as its purpose the measurement of certain general educational outcomes of higher education. This you undoubtedly recognize is a purpose distinct from that of the Medical Aptitude Test.

Whatever evidences of educational status are considered by the admission committee—whether they be college transcripts, examination results, aptitude test scores, personal interviews, or letters of recommendation—the problems of selecting medical students are exceedingly complex. As a first step, the medical school must decide what pattern of previous study is characteristic of its judgment of a high quality applicant. Should applicants to the medical school have a broad cultural background in the socio-humanistic fields? Is outstanding achievement in the scientific subjects the best evidence of quality in beginning students? What represents an adequate premedical training in the scientific fields? In the socio-humanistic fields? Are scientific subjects "cultural" or "practical" aspects of the premedical curriculum? These are questions which must be answered by each institution for itself or by concerted professional action. No educational device or technique can become effective in the absence of a definite operational philosophy of premedical education.

Philosophies of education are constantly changing and evolving. This is as true of premedical education as of the many other phases of the educational ladder. Preprofessional training once stressed competence in the so-called classical subjects, which were the "cultural" subjects of the time. Although specialization in the biological and physical sciences, particularly biology and chemistry, has long been a characteristic of premedical education, this aspect has received varying amounts of emphasis from time to time. Just as the pendulum of educational practice swung away from the "cultural classics" toward the "practical sciences," it now appears to be headed back toward the "cultural" subjects of general education. It remains, however, for each college, or the profession, to discover the preprofessional educational outcomes which develop the quality of men sought by the profession. When these values are reduced to operational terms, admission committees can apply them in identifying applicants of the quality sought.

Identification and definition of educational values do not, however, provide a quantitative method for detecting their presence or absence. Comprehensive examinations like the Graduate Record Examination can provide reliable estimates of important outcomes of the premedical curriculum. If such measurements can be compared with established criteria of student quality, the relative status of individual applicants may, in part, determine their disposition. Where the medical school has not clearly formulated its definition of the expected outcomes of the premedical curriculum, it has no frame of reference against which to evaluate performance on the examination. It is imperative, therefore, that medical colleges using examination results as an auxiliary credential for admission first determine their educational emphases and values as a basis for considering each applicant.

This paper would be incomplete without a final word of caution. The problems of selection and appraisal of men and women of quality are so vast and delicate that a single instrument such as the Graduate Record Examination can assist in clarifying only one element of the total situation. Concerned with the student's knowledge in broad fields of study, the examination admittedly provides no direct evidence of essential personal qualities and attributes, many of which are known to be most influential in professional success. If properly used and interpreted, therefore, the examination will never become an administrative device whereby applicants are selected or rejected on the basis of its results alone. But if performance on the examination is related to all other evidences of fitness and the sum total is carefully weighed and judged, there is good reason to believe that the appraisal of applicants for admission to medical schools can be considerably strengthened.

DISCUSSION

DR. A. C. FURSTENBERG (University of Michigan): I can comment only briefly on the Graduate Record Examination because experience with it has been limited to the Graduate School under the direction of Dean Clarence Yoakum. The claims made in the literature are, we believe, accurate and conservative. You will note that we are asked only to accept the test scores as supplementary to other data on the student. The sampling of undergraduate work is good when you take into consideration the great variety of curricula offered in the various colleges and schools in this country. The examinations often reveal the interest and knowledge of the student not shown by a perusal of the courses he has taken. For example, students who have not studied biology, the fine arts, or social sciences, often show a wide reading and knowledge equivalent to those who have taken a number of these courses, and we believe that such findings are helpful in discovering unusual abilities and in evaluating initiative, resourcefulness and intellectual curiosity.

Also the examinations demonstrate that the broader the foundation in all areas, the more likely the student will continue successfully in the medical school. This does not include the genius, for whom no rules apply, but even he will often exhibit a wide curiosity in things intellectual. I think it can be said also that a low record is usually indicative of poor preparation or inferior intellectual ability. Certainly it calls for a careful scrutiny of the student's credentials. Very few of these students make good in medicine. We are urging our students to take these examinations because we believe they are helpful in determining the eligibility of candidates for admission to the study of medicine and in advising them as to their future progress.

DR. C. S. BURWELL (Harvard University): We are all interested, and will be for a period of years, particularly in the appraisal of men who have been away from active participation in college courses for a number of years. We are going to be concerned with the selection of veterans. Here is an achievement test as opposed to what is hopefully called an "aptitude" test. I should like to ask Dr. Vaughn if he thinks that an achievement test under these conditions is less desirable than when we are dealing with men fresh from college.

Second, do we need any sort of new technics of interpretation, such as new standards, when we are dealing with veterans? What we are trying to do is to select from the veterans the able people, the people with capacity to develop in medicine. Are we going to get misled by comparing the examination results in a man who has been away from his books for three years, with the examination results in the case of a man who left them yesterday, to the detriment, perhaps, of the first group?

DR. K. W. VAUGHN: Your two questions are closely related. In the first place, it is recognized that the measurement of student achievement in college courses may concern itself with factual knowledge narrowly conceived, probably an inconsequential outcome of many college courses, or, on the other hand, measurement may concern itself with knowledge and the ability to use knowledge in the solution of new problems broadly conceived. If one takes this latter view, your second question is answered. If tests concern themselves with the relatively permanent outcomes of college education, it is not likely that one or two years away from formal study will seriously interfere with student performance on the tests.

The present form of the examination is concerned almost entirely with the student's knowledge. The new forms of the examination which are soon to be released place greater emphasis upon the use of knowledge, although they too require a rich educational background. The new forms of the examination are similar to the Tests of General Educational Development developed by Dr. E. F. Lindquist of the State University of

Iowa for the United States Armed Forces Institute. The approach utilized in this series of tests will produce, it is believed, a better measure of the general educational development of those students who have had their formal education interrupted by the war. Researches in our projects indicate that this type of test is particularly appropriate for testing students from many different colleges and universities. Curricula in these colleges differ greatly; supporting factual information and concepts stressed through instruction and study are far from uniform. Consequently, an examination which emphasizes factual knowledge or even important concepts in the field cannot be best adjusted to the graduates of a large number of colleges and universities. It is expected that the new forms of the examination will remove this limitation to an appreciable extent.

In the Engineering Project being conducted by the Graduate Record Office, the Examination Staff developed several tests of the type proposed for the new Graduate Record Examination. The engineering tests have been widely given to returning veterans with good success. These tests do not inquire specifically into what has been taught. Instead, they assume a certain educational background, provide the student with materials with which he may work, and then test his ability to deal with these materials and to think carefully and orderly on the basis of supplied facts.

DR. HAROLD S. DIEHL (University of Minnesota): At Minnesota, for the past ten years, we have required all applicants for the medical school to take a battery of tests, including the Association medical aptitude test, our own medical aptitude test, the so-called "Sophomore Culture" test, known also as the American Council of Education tests of general education, the Strong Vocational Interests test, and the Minnesota Personality Inventory.

The American Council test, commonly called the "Sophomore Culture Test,," contains divisions similar to the test which Dr. Vaughn has just discussed. It, too, gives a percentile rating for the student in various fields, such as literature, history, art, music, vocabulary, mathematics, science and so forth. Our Admissions Committee has felt the scores on this test have been helpful in giving us an all-around picture of the student's interests and abilities.

It is not a test to predict success in medical school, but it has been used as one factor in the decision to admit or exclude certain students, particularly in borderline categories. I am sure our Admissions Committee would feel handicapped if they did not have the test available to them.

Is there any particular advantage in the Graduate Record Examination over the Sophomore Culture Test that we have been using?

DR. VAUGHN: I am very grateful for your comments on the Sophomore General Culture Tests developed by the Cooperative Test Service. It so happens that I am Associate Director of that agency as well as the Graduate Record Office. I hope soon to be able to announce that these two agencies will cooperate in the development of a single series of tests at the college sophomore level. We expect also that these sophomore tests will be strictly comparable with the same tests in the Graduate Record Examination.

We hope also to be able to combine our resources for research purposes. We realize that there is unnecessary duplication in our testing programs at this point and that there is no provision for obtaining comparable measures of growth from the two series of examinations. By combining resources and constructing a single series of tests, we hope to make the sophomore level tests much more effective and useful.

DR. R. B. ALLEN (University of Illinois): This highly significant report points up a situation in which we may be to a degree culpable in that we have for many years

emphasized the importance of scientific disciplines, minimizing the cultural subjects. Here is objective evidence that the social, humanistic field has been neglected, I think definitely to the detriment of medical science and medical education and professional service. Surely, if we, as university people, will encourage our colleagues in the liberal arts colleges to emphasize in their premedical curricula, the need of advising premedical students of the importance of socio-humanistic studies, perhaps in another generation we won't face the situation we face today in our medical schools and among the profession of resistance to an objective consideration of social economic problems in the broad field of medical care.

DR. L. R. CHANDLER (Stanford University): What is the content of the verbal factor you test for?

DR. K. W. VAUGHN: The verbal factor test in the present form of the Graduate Record Examination is a general vocabulary test. Our researches into the effectiveness of this test indicate that it should be differentiated. We are now in the process of constructing four separate tests measuring various aspects of the complex known as verbal ability. These tests include one test of the mechanics of writing and effectiveness of expression and three specialized vocabulary tests in the following fields: scientific, social-economic, and humanistic.

At present, the verbal factor test has served as a component of a scholastic aptitude test, but, as I have said, our studies indicate that for purposes of prediction, it is not sufficient to test the student's store of general words. His knowledge of specialized words may have even greater significance for a particular purpose. The fact that the present verbal factor test is a general verbal test may account for the finding that premedical students have a relatively low average verbal factor score on the Graduate Record Examination. It is my belief that these students have a greater knowledge of word meanings than could be assumed from their test scores. The test given did not present the words they knew.

The Measurement of Medical Aptitude*

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No one would want to return to those golden days when there were no tests of any kind applied to the prospective medical student. Imagine how foreign the idea of measuring aptitude for medicine would have been to the medical school deans of many of the 160 schools of that time. Their greatest problem was to keep their doors open widely enough, and baited with advertising, to attract all and sundry who could hold a pencil or a dissecting knife. Most of the young hopefuls so caught were from high schools—a few were from colleges, with one or two years of higher learning, but most of them had the merest smattering of either schooling or science as special equipment. Their suitability, intellectual or personal, may have been good; often it was very bad. No one asked any questions about its quality. Able men came into medicine in those days when quality was unconsidered, but a host also came who either failed or who began their ministrations to the sick on the thinnest film of knowledge. The real facts are that if the applicant had tuition money and celluloid cuffs for examinations he had all the necessary aptitude for these academic fortresses.

In some of these schools, to be sure, the records indicate that not all in the medical faculties were pleased with the students who came into their nets. In a specific case, a class of 214 hopeful freshmen eventually became 101 grave seniors. The mortality rate was unbelievably high and yet there appears to have been a good deal of forgiveness for ineptitude. One finds student record cards filled with E grades, although the pass mark was only 50. One such student's card shows 5 failures in physiology, 4 in biochemistry, 2 in bacteriology, 2 in anatomy, 2 in therapeutics, 2 in clinical medicine, 1 in ophthalmology, and 1 in surgery, ably supported by 14 D grades during his four successful years. After all, it was not a very golden era.

The first considered effort to measure aptitudes for medicine came when suddenly there were more applicants than vacant seats in the 80 remaining medical schools. Standards for selection had to be improvised with no backlog of time or experience. What did measure aptitude for medicine anyway? To determine aptitude we know well that many aspects of an applicant must be appraised: his character, his dependability, durability, his forcefulness and his vitality. He should have good health and a well integrated personality. He should be at ease working with people. His honesty should be of the highest degree. All of these attributes are a part of his personal make-up but they do not lend themselves to measurement in figures and percentages. Their appraisal must remain relative and be made by those who understand men, their virtues

* Read at the Fifty-sixth Annual Meeting of the Association of American Medical Colleges, held in Pittsburgh, October 29-31, 1945.

and frailties. However, Dr. Zapffe has asked that I discuss scholarship aptitudes, especially as shown by the Scholastic Medical Aptitude Test of this Association. Accordingly, this report is limited primarily to problems of scholarship, although we are well aware of other important factors.

How can scholastic aptitude be measured? How valid are such measurements in predicting scholarship in the medical school?

For some years before the new era all schools had required longer general preparation and had specified several science courses. Perhaps, medical standards were higher than before, for the pass mark had been raised from 50 to 75. Nevertheless, almost as many students as ever were failing. The extra preparation and emphasis on more science courses beyond the minimum did not seem to produce greater aptitude. Two year men graduated with high honors; college graduates failed. In fact, the fellow with the multiple E and D grades was a bachelor of arts and entitled by that degree to admission "to the fellowship of educated men."

There is a certain halo about the applicant with high grades or test scores. Grades are so definite and tangible. It is instinctive to believe that college grades truly represent an applicant's potentiality as a scholar in medicine. Probably that would be more true if the ceiling for grades were not so different at different colleges. We should be skeptical of them until proven by comparison with medical grades. In order to learn how well an applicant's grades and test scores do predict his medical scholarship, we have analyzed the college scholarship records of some 540 Harvard medical graduates. In addition to these there are about 300 war period students for whom we have both aptitude and Army General Classification Test scores. Abilities at the college level may be measured by liberal arts grades, by grades in the sciences and by college honors at graduation. For study, the arts grades were divided into a high, a middle and a low group represented by the traditional A, B and C grades. The other evidences of ability, including medical scholarship, were by fourths.

From all of these measurable evidences of potential ability, there appears an essentially similar picture. With the highest college grades, test scores, or college honors about two-fifths of the men rank in the highest medical quarter. There is, however, a group of them in each quarter, including about one-sixth to one-tenth in the lowest quarter in medicine. With middle quality at the college level there is a fairly even spread into all four medical quarters. It emphasizes that average grades are not so revealing as are grades at the top or at the bottom of the ladder. At the lowest college grades or test scores about two-fifths are in the lowest medical quarter but some of these men, about one sixth, have the highest medical school rank.

It is interesting that the medical aptitude test has played an about even role with college grades in this summary of results. A brief description of the test may be useful.

The Scholastic Medical Aptitude Test of the Association, developed by Dr. F. A. Moss, has now been in use, although not by all admission officers, since

1931. According to professionals in the field of intelligence testing, this test uses principles which are well known in the construction of intelligence and educational tests. Its special feature, as many know, is in some emphasis on material which the medical student will find later in medical texts and journals. Some items relate to elementary physics, chemistry and biology, but this is not to emphasize these unduly. Because these three are required for admission they are a common background, and the only possible one, for all intending medical students. Being required, they supposedly are useful to him, and the test may properly explore his retention. Vocabulary, comprehension and reasoning are also elements in the test. Its purpose is like that of college grades and not more than that. It attempts only to predict an applicant's ability to pass his medical courses. Paraphrasing Dean Sollmann for emphasis, this test is not intended to appraise his personal qualities other than his ability to learn. It tells nothing about his moral or physical characteristics or about his prospective bedside manner, his courtesy or integrity, all nevertheless, of importance in the intimate relationship between physician and patient. The aptitude test might well be rechristened. In its abbreviated form, which we use so naturally, it leads some, notably the applicant himself, to assume that it has very special properties as a vocational test and, therefore, has an assured value in predicting suitability for a medical career.

Before closing this discussion of the Moss test it is well to report here a series of other analyses which have been published in the JOURNAL of the Asso-tion. These have been nation wide in scope rather than local ones based on a limited group of men. Dr. Moss has examined the results of the test over a number of years at the request of the Association's Aptitude Test Committee. Just as with our limited group, his published tables indicate that high scoring applicants have little scholastic difficulty and have higher average grades in medicine than low scoring students. The low scoring men have lower grades, and a high percentage fail to be promoted. It is worth recalling, too, that a special committee, appointed to review these records, and on new evidence of their own, came to similar conclusions. Dr. Zapffe, in his annual reports, has confirmatory data. These show that the number of men classed as "dropped," "withdrew" or "repeaters" is large at low test levels and small at high levels. Also, of the whole number who were promoted to the next class, those who carried encumbered records with them showed the familiar trend. The lowest decile had encumbered records five times as often as the high decile scorers.

In my summary of my own experience with the various predictive devices no emphasis was placed on the differences between them. Actual percentage figures are given here to illustrate them:

Highest rank by college grades or tests—lowest fourth in medicine.

Cum Laude	18	Science grades	13
"A" Arts grades	15	Phi Beta Kappa	11
Army Test	15	Moss Test	9
Summa and Magna	14		

Lowest rank by college grades or tests—highest fourth in medicine.

Army Test	15	Moss Test	11
"C" grades	12	Science grades	10

Lowest rank by college grades and tests—lowest fourth in medicine.

Moss Test	41	Science grades	38
"C" grades	38	Army Test	35

In contrast, highest college grades and tests have the following predictive value for highest fourth medical grades:

Science grades	45	Summa and Magna	40
"A" Arts grades	44	Cum Laude	35
Moss, combined	42	Army Test	35
Phi Beta Kappa	40		

One more observation may be made. If one combines two types of predictive evidence, as arts grades and Moss test, a definitely higher correlation is seen. Unfortunately, the number of men who meet these double requirements is smaller than the number for single ones. It is only this smaller number who have an almost certain place in the medical rank list. All but a few rank in the top half of their class if high scorers, in the bottom half if low.

In developing these actuarial tables, we have had to base them on the assumption that grades given medical students are immutable and represent their assured scholastic aptitudes. That they may not do so is seen in a review of the relative class standing in different medical years for each of some 600 students. Only slightly more than one-fourth were consistently in the same third. Of the nearly three-fourths who shifted from one third to another, fully one-sixth changed from highest to lowest or lowest to highest. But the basic abilities of men do not change, even though their accomplishment may. Clearly, medical grades are not a very good yard stick with which to appraise college grades and test evidences of scholastic aptitude.

The following case histories illustrate why medical grades are not always in line with expectation by any one actuarial table, or even by several:

Case 1.—In spite of an aptitude score of 98, a bachelor degree Summa cum Laude, with an A college record in Arts and in Science, this man ranked lowest third for the first year and lowest half on four years. He was far too busy being a junior fellow of the college and in writing a book.

Case 2.—With an aptitude score of 97 and just below a B college average he ranked lowest twentieth in his class and barely escaped the plucking board. He was too active in promoting the welfare of the Association of Interns and Medical Students, active in suggesting changes in the curriculum and in attending seminars on socialized medicine.

Case 3.—He had an aptitude score of 99 with B college grades, but graduated in the lowest tenth. He gave the impression at all times of being well rested, well fed and happy. Even when he had a good idea, the effort necessary to develop it was apparently incompatible with maintaining his sense of well being.

Case 4.—His aptitude was lower but still upper sixth, with B college grades and a degree cum Laude. He was dropped after two years on low grades. Wine, women and song were his undoing, with the Navy Shore Patrol helping to decide the issue.

However, much we may try to establish more accurate measures of potential scholastic ability, the students clearly are complex biological specimens and do not lend themselves reasonably to any bio-assay methods.

No mathematical system of so many points for college grades or for test scores, so many for sponsoring letters (too often written by young instructors), or so many for the interview, will fully serve us. Just as medical diagnosis is aided by the laboratory, the selection of medical students is improved by using more than one test. But both in medicine and in the admission office tests should take their proper place and not more. The prognosis for both patient and applicant is to be determined clinically and not with an adding machine.

DISCUSSION

DR. A. J. CARLSON (University of Chicago): It seems to be assumed in all these scoring tests of the student when he comes in or when he is flunked or graduated; *a uniformity of performance of the teachers in all the medical schools.* Is there any way of estimating that factor in the performance of the students, high or low, in the medical schools? Certainly that is one of the important variables in my experience. Students who have a poor teacher in a subject give less attention to that subject. That should not be the fact. It is the subject for the profession, not the teacher. But it does not work that way. We are assuming too great a uniformity in our medical schools in the quality of the teaching environment we subject the high and low entrants to in the freshman year, and the other years.

DR. KENNETH W. VAUGHN (The Carnegie Foundation): I should like to ask one question. Dr. Hale, have you found the men who stand in the lowest 10 per cent on your aptitude tests and other measures, showing quite the same variability as those standing in the upper 10 per cent? In other words, is it not true that you may expect in the upper per cent or upper quarter of any group a good deal less precise prediction than you would in the lowest 10 per cent or the lowest quarter?

DR. WORTH HALE: I can only talk about our own figures arranged by quarters. I do not know what our lowest tenth is. In every school the average level of the aptitude performance on the Moss test probably varies. The figures that have been published show that men in the lowest decile are still in college and still getting through college courses. Published reports indicate that men in the lowest decile eventually graduate. I think the figures show that about 22 per cent were dropped, withdrawn, or are repeaters. Those who go into the next class with encumbered records, still in the lowest decile, are about 27 or 28 per cent. My memory is not too certain of these figures, but even in the lowest decile, many have been graduated.

When one examines the low decile points on which a man enters medical school, one finds the smallest number accepted, I think around two hundred in the lowest, running up to six or seven hundred in the top decile, about a thousand men normally being in each decile.

Interest and Attitude as Factors in Achievement in Medical School*

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This essay is a study in hindsight. Each year from 10 to 15 per cent of the students who enrolled in medical colleges as freshmen—filled with enthusiasm and even falsely high hopes—fail to complete the year satisfactorily. Illness, loss of interest and financial problems appear among the causes as well as scholastic inadequacy. There is a second group of students who experience scholastic difficulty but who are continued, at times reluctantly, in the study of medicine. This is a group which the Admissions Committee, if it had been wiser or if it were given a second choice, would probably have denied admittance. Happily, there is a third group—much larger than the above two groups—about whom the faculty feels content and at times experiences a glow of pride in their achievement. My purpose is to inquire into the extent to which our devices for selection perform their tasks in differentiating these students and to find, if possible, means or probable directions for their improvement.

The question to which we seek an answer is: Are there certain characteristics of ability, interest, attitude and experience that differentiate the successful from the low standing and failing students? In seeking an answer, two restrictions have been imposed. First, the appraisal shall be an objective rather than a subjective judgment, and second, the tests or scales used shall be applicable to large groups of students and not require administration to an individual by a skilled examiner.

The data to be presented are derived from four classes at Washington University School of Medicine. The two classes which recently graduated were admitted under nearly normal peace time conditions. The other two classes, currently our juniors and seniors, were admitted under the pressures of the Selective Service Act. Only two students in this study were assigned to the School under the Army and Navy Training Programs. The several classes did, however, receive all their medical school training under the accelerated program.

Each class was given a series of tests, either during the registration period at the beginning of the year or early in the freshman year. The group of tests includes the following:

1. A test of intelligence designed to measure capacity to do abstract thinking at a high level. No time limit was imposed in this test; each student worked at his own tempo and had ample opportunity to put forth his maximum effort. (Thorndike—CAVD.)

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* Read at the Fifty-sixth Annual Meeting of the Association of American Medical Colleges, held in Pittsburgh, October 29-31, 1945. A more detailed statistical analysis of these data will be published in a technical journal.

2. A simpler test of intellectual ability was given under severe time limits so that a premium was placed on speed as well as intellectual level or power. (Wonderlich—Personnel Test.)

3. A reading test designed to evaluate the student's ability to read, comprehend and answer questions about selected literary passages. (Haggerty—Reading Examination.)

4. A test of vocational interests and attitudes. (Strong—Vocational Interest.)

5. A test sampling the student's degree of social and emotional maturity. (Minnesota Personality Schedule.)

6. The scores on the Medical Aptitude Test were available for virtually all of these students.

The relationships between quality of performance in the testing situation and achievement in medical school—in most instances covering a period of three or four years are summarized in table 1. If we consider, first, the groups of students numbered 1 through 5 (1 representing the highest ranking 20 per cent of each class, and including students who have received their degrees or are still in good standing), we find that there is a clearly positive relationship without reversal between test score and achievement. This relationship is similar for Medical Aptitude Test and for the Intelligence Test (unspeeded).

TABLE 1.—Medians of percentile scores (based on 500 students enrolled in six successive classes in Washington University School of Medicine) for successive quintiles of students graduating or in good standing and for a group of students who have failed.

	QUINTILES					
	Highest				Lowest	
TESTS	1	2	3	4	5	Fail
Medical Aptitude	82	65	58	49	32	45
Intelligence (CAVD)	72	61	61	44	34	46
Intelligence (Speed)	67	46	53	46	47	33
Reading Skill	70	61	50	49	51	34

The group designated "F" consists of students who failed or who withdrew with unsatisfactory grades. Cases of frank physical illness have been excluded. It is at once evident that this group has talent considerably in excess of Groups 4 and 5 which have satisfactorily completed their work. These findings are in accord with our common experience that great talent is not *per se* an assurance of high achievement. For many of these persons the cause of failure must be sought in other aspects of the personality than the realm of ability.

As with the aptitude and intelligence tests, the relationship of speed and of reading skills to achievement is positive. However, Group 2 shows a marked difference between intellectual level and speed level. It is apparently a group of highly able but slower working students. In Groups 4 and 5 the levels of reading skill and of speed are above that of aptitude. One is inclined to see in these two factors compensatory elements for the lesser intellectual capacity. In comparing the performances of the "F" group a striking discrepancy is noted between aptitude and levels of reading and speed of work. Group "F" is especially weak in these areas in contrast to the high intellectual level.

Thus far, we have considered trends among groups of students. Interesting

as these may be, the critical evaluation must, however, be made in terms of prognosis for the individual student. When this is done, the inadequacy of selection procedures, whether by test, interview or letter of recommendation, becomes embarrassingly evident.

For purposes of analysis each class was divided into two groups. One, designated as "High" in the summary tables, comprises approximately the upper four-fifths of the graduating students. No effort has been made to differentiate within this group between the competent student and those few exceptionally talented persons who grace every class. The second group, designated as "Low-Fail" is made up (a) of low standing students who experienced more or less difficulty in their work but none the less were graduated (about one-fifth of the class) and (b) of students who failed or withdrew at some stage of their training. The numbers in these groups are 160 and 78, respectively.

For each of the tests of ability a critical or cut-off score was determined so as to give the maximum differentiation between the groups of high and low standing students. On the Medical Aptitude test this cut-off value was slightly below the 50th percentile.

TABLES 2 THROUGH 6.—Efficacy of the several tests in differentiating the satisfactory from the low standing and failing students. The numbers of students in the several categories are given.

TEST PROGNOSIS / ACHIEVEMENT	GOOD		POOR	
	High	Low-Fail	High	Low-Fail
TABLE 2				
Medical Aptitude Test	128	49	32	29
TABLE 3				
Composite: Intelligence, Speed, Reading	134	44	26	34
TABLE 4				
Vocational Interest	135	53	25	25
TABLE 5				
Personality Schedule	148	56	12	22
TABLE 6				
Composite: Intelligence, Interest, Personality	160	62	0	16

Let us now direct our attention to the results on the Medical Aptitude Test (Table 2). We find that the status of 157 students has been predicted properly but that we have predicted incorrectly in 81 cases. If we had denied admission to all applicants scoring below the cut-off value, we would have excluded 29 students who did fail. However, this would have been accomplished with exclusion also of 32 students who did successfully carry on their work. It would have been an expensive price to pay. (N. B. We do not know what similar loss of good material occurs under current admission practices.)

Similar data are presented for a combined score of the two intelligence tests and the reading test (Table 3). One hundred sixty-eight cases are correctly predicted and 70 are incorrectly placed. The prediction is slightly, although probably not significantly, better than for the Aptitude Test.

A further combination of Medical Aptitude Test and the several intelligence and reading tests did not yield a better prediction. It thus appears that if

intellectual ability and its concomitant products are once measured adequately, repeated measurement does not, thereby, increase accuracy of prediction of the relationship between the trait measured and some activity such as the study of medicine. If prognosis is to be improved a new facet of the personality must be examined. The student's vocational interests and attitudes appear to be such an aspect of personality.

The Strong Vocational Interest Test was used to appraise vocational interest in distinction from aptitude. On this test, the student expresses either his liking for or his disinterest in some 400 variously assorted items covering school subjects, professions, recreation, people and miscellaneous activities. It has been determined empirically that men satisfyingly engaged in a given profession, e. g., medicine, exhibit a cluster or pattern of interests that demarcates them from an unselected group of men in general. More broadly, several large groups or families of vocational interests have been identified: (1) a science group, including medicine, (2) a welfare group, illustrated by the ministry, and (3) business detail and contact groups.

About 80 per cent of medical students express a high community of interest with men engaged in scientific work. This group might reasonably be expected to have greater drive and attendant success in the study of medicine than the group of students lacking such scientific interests. The efficacy of the Vocational Interest Test in differentiating the satisfactory students from the low and failing group is also shown in Table 4. It is here seen that the exclusion of all students lacking in scientific interest would have eliminated 25 unsatisfactory students but it would have done so at the too high cost of 25 satisfactory students.

The combining of scores on the interest and ability tests resulted in no better discrimination than that achieved by the ability test alone. Ability, success and interest, within such a highly selected group as medical students, are apparently too dependently, and even circularly, related for a measure of interest to increase the predictive value of the ability tests.

From observation and personal experience all will acknowledge that the attitudes, sentiments and feelings of the doctor toward his patients and fellow human beings can and do play a role in his ultimate success. We seek among applicants to medical school those youngsters we characterize as sound, or as stable persons, and, in turn, try to avoid the emotionally immature, the queer fellow or the screw-ball. One of the main functions of the pre-admission interview is the detection of such personality defects.

The objective measurement of these "intangible" aspects of personality is far more difficult and currently less satisfactory than the estimating of ability and achievement. The Minnesota Personality Schedule is one of the better standardized and validated tests of personal adjustment. For purpose of this analysis four groups of students were identified by the M. P. S. They may be characterized—taking a bit of liberty—as follows:

1. The extremely introverted individual or the youngster who lives within himself and neither desires nor seeks warm friendly relations with people.

2. The youngster who continues to wage an adolescent rebellion against his family long after the time his classmates have worked through this stage of development.

3. The insecure person, the student who feels when he looks at the image in the mirror as he shaves in the morning—"there is a mouse, there is a fellow who isn't worth much and that fellow is me." And by contrast—

4. The arrogant, cocksure chap who is so certain that in him is found the epitome of perfection; so much so that he is unable to accept criticism or suggestion from faculty or fellow students.

It is assumed that such sentiments are a handicap to a student of medicine unless they are modified or compensated by other assets. The predictive value of this assumption is summarized in table 5. It is noted that the predictive value is higher for this trait than for any thus far considered. Twenty-two unsatisfactory students would have been excluded by this criterion at a cost of only 12 good students.

However, one should inquire further into the characteristics of these 12 successful students—what assets enabled them to do the job? Let us make a further assumption. A student with high ability and strong interest and drive will succeed in spite of social and emotional immaturity, whereas the person lacking these compensating assets is likely to fail. The predictive value of this second assumption is shown in table 6. It will be noted that the 12 successful students had such assets of ability and interest, as did also 6 of the 22 students in the low failure group. There is a residue, however, of 16 unsatisfactory students with immature personalities who lacked interest or ability. These could have been excluded without the loss of one satisfactory student!

The zero value is, I am sure, fortuitous. These assumptions must be tested on a new group of students. This has been done for the lower classes now in school. The results are in substantial agreement with those presented. In two additional classes, 19 of 25 students who gave evidences of emotional immaturity are correctly placed. Three satisfactory students would have been lost.

In summarizing the results for five successive classes we find that

1. Fifty-nine students were classified as having some presumably handicapping personality traits.

2. Twenty-five of these had compensating assets of high ability and scientific interest and did satisfactory work in school.

3. Nine with such assets did unsatisfactory work.

4. Twenty-two students with personality handicaps were also low in ability or scientific interest and did unsatisfactory or poor work as students.

5. These 22 students could have been excluded at the expense of only 3 satisfactory students.

It has been possible, then, to identify a group of students with a cluster of abilities, interests and personal sentiments that augur poorly for success in

medical school, and to say with reasonable probability (the chances are 1 against 7) that they will not succeed as medical students.

My purpose in presenting these findings is not to offer a sure fire method of selection. None exists. But I am confident that more adequate devices than those used in this study can be developed. We have too often been content to put aside this difficult problem of appraising the personality of the prospective student of medicine and to cover our inability in this field with a reference to the "intangibles" of the personality. I do not intend to minimize the difficulty of the task but it will only be through empirical studies that more adequate procedures will be found.

It is my hope that as an Association you will encourage your Aptitude Test Committee to explore these and other new devices as supplements to the present Medical Aptitude Test.

DISCUSSION

DR. PHILIP A. SHAFFER (Washington University): As I listened to the earlier papers on a somewhat related subject, I had the feeling that there was something of disappointment and frustration in the experience of the other speakers with various tests. I certainly have for many years shared that feeling of disappointment from our efforts to make a wiser selection of students. It is now my impression from the sort of hindsight Dr. Jacobsen has described, that there may be real hope of a more nearly intelligent interpretation of what we used to do or think we could do; of somehow determining the characteristics of the man and his reaction to ordinary life, what sort of person is he. Adding that sort of criteria to carefully chosen tests for objective administration, I have the feeling that it is going to get us somewhere. I should like to endorse heartily the suggestion of Dr. Jacobsen that the committees of this Association give more thought to a combination of such tests for more widespread use in evaluating the qualities of applicants for the study of medicine.

DR. A. J. CARLSON (University of Chicago): Could you tell us how you quantitate the degree of interest in science on the part of these students? Is it just by their talk, by their saying so? How reliable is it?

DR. CARLYLE F. JACOBSEN (Washington University): The Strong vocational interest test is a test consisting of some four hundred items, to which the student is asked to respond by indicating either that he likes it, that he is indifferent to it, or that he dislikes it. For example, there are some hundred occupations listed and he is asked, disregarding ability and aptitude that he may have, Would you like to be an engineer? Would you like to be a doctor? Would you be indifferent to it, or dislike it?

There are lists of professions, of school subjects, of recreational activities, characteristics of people—for example, if I were to ask you, Well, how many of you like people who have an array of gold teeth out in front? How many of you do? How many are indifferent? It is found that among a group of doctors, for example, there will be a cluster of interests and attitudes that will characterize them as a group of professional people, and that will at the same time differentiate them from a group of men in general. This is an empirical finding, not a theoretical approach to it. It may be a stupid question, but maybe stupid questions reveal useful information about people.

The score on the test is expressed as a measure of the community of interests which you have with other people doing this job. Here is a youngster who responds to the

test in the same fashion that a doctor does, and here is another youngster who responds to it in quite a different fashion that simply does not fit that pattern, so that we are speaking of a community of interests. I would emphasize, as Dr. Strong does, in developing this test, it is no measure of the aptitude to do a job. It is no particular measure of the intensity of interest, and that it does not touch upon, but it does touch on this other aspect of, Do you like the same sorts of things as men who have been satisfyingly engaged in this profession for many years?

We find that about 80 per cent of our students express a high community of interest with men doing a job in the scientific fields; 20 per cent do not, and that 20 per cent constitutes an undue proportion of the men who drop out of medical school before their first two years are over.

DR. STOCKTON KIMBALL (University of Buffalo): Would these tests throw any light on the situation of the veteran with a C average in college, who has developed a medical interest from his war experience, and has now much more seriousness of purpose, and is desirous of entering medical school? He has taken no further work by which we can judge him. I instance one man in that category who was a prisoner in Germany for three years, during which time he got medical books from the Swiss Red Cross and spent all of his spare time reading these medical books. According to usual standards we would not take such an individual; and yet we will be unfair, certainly, to some persons who have developed an aptitude and seriousness. Could the tests described aid us in avoiding being fooled?

DR. CARLYLE F. JACOBSEN: The question you have raised is not peculiar to the group who have been in the Army but it is characteristic of any youngster who is growing up. If you were giving the Strong interest test to a group of high school students, you would find in plotting a profile over some forty or fifty occupations or groups of occupations that maybe back at the junior level there is a beginning something that looks like a crystallized interest pattern, but when you got to the senior year, with the same student, in the majority of instances it is quite more nearly recognizable as a clear, crystallized direction of interest. When you get to the college level, you find that there are in a cross section statistically many more students who have found some area of interests.

Interests do not remain static. They change. They change with success in an undertaking. They will change with success in scientific studies in school, for example, so that we have to take this as a cross section test at the time. It would be nice if we could have two tests and have a longitudinal study of that student.

I would not be too concerned about the man who has been in service, if he has a certain measure of interests as expressed on the test or even in terms of his own interest, if he will, along with that, bring the qualities of ability and of personal integrity to apply to it. We may find the interest test would be of some value in discouraging the men. When we get to positive finding, I do not know whether one would want to go too far on the basis of that value alone. I want to emphasize that you must approach it empirically. There is no á priori basis on which you can set it up and say: This will do the job. It is only as you evaluate over and over again that you can establish the statistical frame.

DR. F. A. MOSS (Washington, D. C.): I was very much interested in the three preceding papers. All three papers demonstrate that admission officers in medical schools need all the data possible in making their selection of medical students. No one criterion is perfect. The best criterion is a combined criterion. For a number of years such a criterion has been secured by combining the premedical grades, the scores on the Medical Aptitude Test and certain more intangible personality data as gleaned from personal interviews,

letters of recommendation, etc. Dr. Jacobsen's paper shows considerable promise in strengthening this third set of data, and further work should be done along the lines set forth in his paper.

The tests described by Dr. Vaughn would be of help in some instances in improving the reliability of the premedical grades factor. Where a medical school gets its students from a large number of premedical schools, the premedical grades tend to be relatively unreliable as a criterion of performance in medical school, and in cases like this a good achievement test such as that advocated by Dr. Vaughn would be of help. But in cases where a medical school gets its students from only four or five premedical schools, the grades made on the premedical subjects are very satisfactory. This was demonstrated by a study at Stanford University in 1931. In that year a very large percentage of their medical students had received their premedical training at Stanford. With this class they found a correlation between premedical grades and medical school averages of 0.67, and between scores on the Medical Aptitude Test and medical school average of 0.64. But by combining the premedical grades with the Aptitude Test scores and correlating the combined criterion against the medical grades a correlation coefficient of 0.81 was obtained. This is an exceedingly high correlation and shows clearly that the combined criterion gives the best predictive value.

Dr. Vaughn's study also verifies a finding of our Committee, viz: that the premedical grades in the sciences and mathematics give a much higher predictive value than do the grades on such cultural subjects as English, literature, and the social studies. A student's knowledge of the answer to such algebraic problems as $A^6 \div A^2 =$, or his knowledge of the meaning of "zygote" give good indications of how well he will do in medical school. But whether he has ever heard of Hawthorne's "Scarlet Letter," or if he locates Oslo in Italy rather than in Norway gives no indication of how well he will do in medical school.

Prospective doctors should in all probability take more premedical courses of a general cultural nature, but the way to insure that such courses will be taken is to prescribe them just as we now prescribe a minimum of 8 semester hours in biology, 12 semester hours in chemistry, and 8 semester hours in physics. But in interpreting the premedical grades on these subjects, we should remember that grades in mathematics, physics, chemistry, and biology give a high predictive value, while grades in literature, history, and the social studies give a very poor indication of how well one will do in medical school.

Social and Environmental Factors in Medicine*

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The interest of the Association of American Medical Colleges in the form and content of medical curricula is a natural and proper one. Considering the potentialities of the Association, its power to mould and compel acceptance of subjects and techniques in medical education seems to have been exercised with great restraint. In no field does this appear more evident than in the teaching of the way in which social, economic and other environmental factors produce, delay effective treatment of or favor the relapse of illness and disease. Here and there over the past generation, a notable medical leader has made important beginnings in this field. Great progress has been made in some schools. But there is no uniformity in methods or subject matter in teaching and it might be feared not even a universal acceptance of the great importance of this subject. It is with great satisfaction, therefore, that the report of the work of the Joint Committee on the Teaching of Social and Environmental Factors in Medicine may be anticipated. The happy fusion of the forces of this Association and that of the American Association of Medical Social Workers in this endeavor promises a proper emphasis on the subject, and, in time, the adoption of more or less uniform standards of teaching medical students the relationship of social and environmental factors to disease, and the physician's proper place in the social structure of the community as a whole.

It is not the function of this paper to develop the ways in which social and environmental factors influence disease and disability. It is to be assumed these are well known to all of us. Their importance in the mind of the physician is directly proportional to the nearness with which he approaches the problems of the individual patient, as a rule. It is most acute in those who earn their living in the practice of medicine or who are in daily or frequent contact with dispensary or ward service in large urban hospitals. Nevertheless, this does not prevent the medical educator, whose activities are wholly or largely administrative or in the laboratory, from accepting the importance of these factors in disease. The purpose of the paper is to report an experiment in teaching and to make some deductions from it.

In the winter of 1943, an instructor of the School of the Applied Social Sciences of the University of Pittsburgh asked the Dean of the medical school for assistance in carrying out a detail of her work. This required that a place be found in a hospital where medical social worker students could have field instruction. Also, that they be given an opportunity to see and understand the methods of medical practice, to become acquainted with the behavior of the physician in the diagnosis and treatment of disease and to learn at first hand something of his skills and limitations. Since all of her subsequent professional

* Read by title at the Fifty-sixth Annual Meeting of the Association of American Medical Colleges, held in Pittsburgh, October 29-31, 1945.

life is to be spent in collaborative effort with the physician, the establishment of a sympathetic attitude toward him and his work was a matter of great importance. The matter was referred by the Dean to the instructor in charge of medical teaching in the Presbyterian Hospital of Pittsburgh, one of the institutions closely affiliated with the medical school. The instructor saw an opportunity, long desired, to accomplish a similar purpose for the medical student and give him a chance to learn the value and professional dignity of the medical social workers; to see personally how her interest in the well being of patients exactly paralleled his own; to learn that there is not and cannot be a basic conflict between the ultimate aims of either the physician or the medical social worker; to appreciate that their common care in the well being of the patient naturally expands into a similar care for the well being of society at large. Thus a fortunate circumstance and a common interest united two small groups of students in a mutually helpful endeavor.

The medical student group, composed of seven or eight junior students, was on regular clinical clerk assignments in the Presbyterian Hospital. The pattern of such instruction is well known. Among their activities was a weekly conference at which one of them presented a complete case, i. e., complete up to the moment of presentation. As part of this presentation he was expected to explore social and environmental factors as parts in his history of the case whether relevant or not. It was decided to make a joint student presentation before instructors from both schools.

The medical students' presentation continued as usual. The medical social worker student presented the social, environmental and economic background in much greater detail and with the developed skill and emphasis of her separate specialty. Where the social factors were a major influence in the cause of disease the medical students' presentation would be interrupted for inclusion of that of the medical social worker before diagnosis was discussed: sometimes it was presented before final discussion of treatment. At other times it was presented after the medical student had finished his part of the program to show the social resources of the community available to the physician in treatment of the particular problem presented. The medical instructor directed the conferences with the assistance of the instructor from the School of Applied Social Sciences. The conference met once a week and normally lasted an hour. Because of general interest and discussion, it was usually difficult to limit them to that period and they often lasted 15 minutes or half an hour longer.

In support of the particular emphasis being given social and environmental factors in these conferences attempts were made to select illustrative cases whenever possible. But it was found that sufficient material for pertinent discussion occurred even in unselected cases. Presently the medical instructor found this the most interesting and stimulating class he had to meet. Medical social workers were not being trained in the accelerated program of medical students. Hence a time came when there would be no medical social worker students in attendance. To abandon the method now seemed impossible. So it was continued with the medical social worker of the hospital making the presentation

which her student would otherwise have done until the curriculum time of both sets of students again coincided.

It is not possible to point to impressive proven results. Since its inception, about sixty junior medical students have had brought to their attention ten or twelve times the importance of social and environmental factors in disease. In all, about 600 student hours have been so spent. They have worked with groups of medical social workers of about their own age and of about equal professional and cultural development. They have had a chance to learn of the resources of the community of help to the physician in attempting to render a larger service to his patient. They have considered the technique of commitment of cases to institutions for the mentally ill. The social problems of irreparable conditions associated with cardiovascular and neoplastic and other diseases have been presented and they have learned of the terribly overcrowded conditions in those state and county institutions available for the care of such patients by the dramatic difficulties met in attempts to place them. That it may take from three to six months to gain admission for an open florid case of pulmonary tuberculosis into a state sanitarium was pointed out.

Some of this knowledge apparently amazed and dismayed them which was a good thing. Their enthusiasms and sense of right and justice have been so far spared the deadening effects of some of the actualities they will later have to face in professional life. But they have been forewarned and, it is hoped, will be stimulated when the time comes, to take a more active part in correcting some of these situations which so seriously require change. They have seen that the facilities of social agencies are not reserved alone for the absolutely indigent; that they may be employed with great advantage for that very large group of citizens living just above the dependency level; that such services are available not only to the physician engaged in hospital practice but also to those in private practice. It is hoped they have also learned that the need for relief through social agencies is often first discovered by the physician and that he may and should set in motion the machinery to bring relief.

It is to be noted that neither the medical student nor the medical social worker student has been taken out of his familiar environment in the class room. It is possible that this should be changed and, at least, so far as the medical student is concerned, some of his time should be spent in visiting the homes of the patients he has examined. Such a procedure is followed in some schools, usually applying to a single case for each student, under the direction of a medical social worker. It should, of course, be evident to any one that there is no intention to make social workers out of medical students or medical practitioners out of medical social worker students. Hence, it seems hardly logical to have the medical student actually do himself what the medical social worker student does. It would be just as logical to require her to remove an appendix so that she might better be able to appreciate the problems of the surgical patient and the surgeon. This form of teaching is not to develop a special skill but to create a recognition of the need for that skill and a knowledge of where it may be obtained. Domicillary visits, if made by medical students, should be in the

capacity of a physician but of a physician alert to the social and environmental factors which his visit may reveal. Besides, if such visitation were added to medical curricula many additional hours of time would have to be found or taken from other equally important subjects. The purpose of this method of instruction is to bring into proper etiologic focus the effects of social and environmental factors in medicine and to teach the medical student what he may do about them.

In the process of this training, the medical student soon learns that some of the causes of illness in his patient cannot be corrected by the efforts of the physician alone. There is a necessary, an indispensable part which society must play. In his analysis of these problems and in learning to depend on social instruments for amelioration or cure, he sees mirrored in the microcosm of the individual patient's dilemmas some of the troubled questions which now especially vex the profession to which he aspires and society in general. It would seem a serious negation of teaching were the medical student not encouraged to explore these questions. So it is a natural step to introduce him at least to the operation of workman's compensation laws as they apply to a particular case he has studied. Health legislation of his state and of the nation naturally fit into such a teaching program. In their better aspects, at least, they represent the joint efforts of physicians and society to remove or correct social, economic and environmental factors which act as causative agents in favoring the spread of disease or preventing or limiting its effective treatment.

To apply this idea, twice in the past twenty-seven months groups of medical students and medical social worker students studied the Wagner, Murray, Dingle Bill. These studies were made as objective as possible and were kept entirely free from partisan, political or emotional discussion. The purpose of the study was to give the medical student knowledge of facts from which he might make his own deduction. Physicians should seek facts in their endeavor to understand and to correct the ailments of society just as they do in similar efforts for the individual. It is lamentable that with the rising tide of social legislation thundering on the shores of our professional existence there are among physicians so few with the sociologic insight and breadth of vision needed to guide the rest of us into wise channels of effective and corrective cooperation. Too often, we seem to be led in paths of useless emotional opposition.

It is late to regret that a generation ago medical educators did not insist on more sociology and less chemistry or physics in premedical education. Had they done so we might now have more among us better able to show a nicer balance between the rights of the physician and the rights of society. The medical curriculum seems to provide the proper medium for beginning the indoctrination of the young physician with the idea that his duties to the individual patient are exactly similar to his duties to society at large. Where his patient duty requires unremunerated loss of productive time, exposes him to danger of contagion or calls him forth at dead of night on icy dangerous highways, we expect him to submerge his own interest for the welfare of the patient and serve him as his need requires. Should he do less in his duty to the welfare of society?

It is to be observed that this experiment in teaching began in the middle of the war. It did not entail any addition of hours to the medical curriculum. It simply set aside certain of those hours for special emphasis of a very important subject. It did not involve the outlay of an extra penny. The class continued with the help of the Social Service Department of the hospital even when medical social worker students were not available and, therefore, could be duplicated in institutions where the latter type of student is not normally present. It gave sixty medical students an opportunity to see the value of cooperative effort of the physician and medical social worker and, it is hoped, sent them forward into full professional life with an attitude to the medical social worker which will always be one of appreciation and esteem, as it should be.

In conclusion, any thinking physician of our day must be dismayed at the seeming absence of a broad social outlook on the part of many of his colleagues; at their inability to see the trend of events as society at large becomes more and more aware of what it wants from its physicians and of its increasing determination to get what it wants. The wish of all good physicians, to be sure, is to accomplish the greatest good for the greatest number. This is also the wish of society. About the means of accomplishing the common aim there are, of course, differences of opinion. But it seems beyond doubt that in our complex society of today neither physicians nor society alone can achieve this end. There must arise in the medical profession men and women who are not only physicians but who also have the broader social outlook which makes them see that their obligation to the individual patient is the same as their obligation to society at large—to do their work for individual or society with fidelity, and skill and unafraid of the machinations of politicians within or without their own profession.

The German University Medical Schools During the Occupation

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At the invitation of Major General Morrison C. Stayer, Chief of the Public Health and Welfare Division of the U. S. Group Control Council (Germany), I visited, during August and September, 1945, all the universities in the United States Zone of Occupation, and the majority of those in the other three zones, with Major H. M. Rozendaal, Captain J. S. Lichty and Dr. E. Y. Hartshorne, who were assisting General Stayer in the resumption of German medical education. Their excellent observations as well as the results of several prewar visits to Germany are incorporated in this report.

BACKGROUND: The German medical schools, which were good in 1912, have not kept pace with the advances in medicine. Except for an occasional specialist who has become famous, the German graduates, even those who took postgraduate work as assistants, are not equal to the average American senior medical student. The reasons are: lectures without adequate laboratory and clinical work; too many students with little or no selection (of the 6,000 total university students at prewar Munich, 4,000 were medical); inadequate facilities; and faculties which are too small, the members of which do not know modern non-German medicine, whose salaries depend on the number of their students so that they are tempted to encourage an increased enrollment, who also examine their own students and thus may lower standards, and who have too much private practice. Furthermore, the segregation of research workers from the medical schools into Kaiser Wilhelm Institutes has reduced the productiveness of German medicine so that the medical journals for a generation have been of little scientific value. Unfortunately, most of the Germans do not realize that improvement, reorganization, limitation and supervision of medical education are necessary. As a result, although accurate figures are not available, German physicians, in addition to being poorly trained, are too numerous. The early opening of the medical schools is unnecessary to supply more physicians, but it is desirable in order to maintain the continuity of medical education. The German medical schools should be a warning to us not to let our pride in American medical education reach the point at which we are completely satisfied and are unwilling to try to improve it.

Of the seven schools in the United States Zone, only three have intact physical facilities (Marburg, Heidelberg and Erlangen), but the other four (Giessen, Frankfurt, Munich and Würzburg) have improvised usable accommodations for the hospital care of patients in their communities; their facilities for teaching, however, are inadequate.

Three programs for the opening of the medical schools have been suggested.

1. LIMITED DENAZIFICATION WITHOUT REFORM: Reopening as they now stand, with denazification limited to the removal from the faculties of only those individuals arrested under the orders of the Military Government or re-

moved by action of the present faculty or its planning committees. This is the plan desired by the Germans themselves. It would permit some individuals, who would ordinarily be removed under existing directives, to continue in their present positions, but it is contrary to the aims of the Military Government.

2. COMPLETE DENAZIFICATION AND REFORM WITH ACTIVE AMERICAN PARTICIPATION: Complete denazification of the university; rigid selection of students; reorganization of the curriculum to introduce laboratory and bedside teaching in place of the present lecture system; establishment of a uniform, short, practical, final examination to replace the time consuming *Staatsexamen;* the payment of adequate teaching salaries with the university retaining all student fees; provision of supplements to German libraries and laboratories from American sources; and sponsorship of each opened German medical school in the United States Zone by some American medical school, which probably, if invited, would rotate some of its faculty members to the German school so that modern teaching methods could be established and maintained. Although the installation and continuance of this program would benefit both the German and American medical schools, it is impractical because of the uncertainty of essential German cooperation and the possible adverse reaction from American and Allied sources.

3. COMPLETE DENAZIFICATION WITHOUT REFORM: The denazification of the medical faculties without reorganization of the curriculum, except for the elimination of Nazi ideology and of dangerous research activities.

CONCLUSION

The third program is the most practical one, and is in accord with the aims of the Military Government, making the Germans work out their own problems after having been completely denazified. Complete denazification automatically removes more than 50 per cent of the members of faculties and staffs from the schools, and the result raises the serious problems of adequate personnel and the maintenance of the standards of medical education. Traditionally, the size of the medical faculty of each university has been small, numbering from 50 to 60 individuals, some of whom are only nominal. The clinic assistants, who are in addition to the faculty, have no part in the instruction of students even though they are full time employees of the university. Denazification will leave each medical school with several departments in which no individual of the former faculty remains, and the majority of the assistants also are slated for removal from their present positions. Heidelberg and Marburg have been able to conduct postgraduate courses with a denazified teaching staff because a complete curriculum is not required. However, politically acceptable replacements were obtained from the United States Zone so that Heidelberg and Marburg were able to open in November, 1945, with regular medical semesters, the former with 1,050 medical students, and the latter with 1,250 medical and dental students!

I wish to express my thanks to Major General Morrison C. Stayer, Brigadier General James Stevens Simmons and Colonel Thomas B. Turner for making this survey possible.

The Future of Electronics and Electrical Instrumentation As Related to Medicine

(With Special Reference to the Course of Training and Research in Physics and Technology as Applied in Medicine at the Massachusetts Institute of Technology)

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In conjunction with the survey conducted by the Baruch Committee on Physical Medicine to determine the needs for development of an adequate program of teaching and research in physical medicine, it became apparent that there was a need for better understanding of biophysics, electronics and instrumentation as applied to medicine on the part of the medical profession, and in its original report this Committee recommended "that because of the increased importance of electronics and other physical agents, one of the centers of physical medicine promote the co-ordination of the work in research laboratories devoted to projects in physical medicine with the work in other research laboratories, commercial and academic, in the hope of furthering the development of electronic and other physical equipment which could be employed in research in, and clinical application to, physical medicine." With this thought in mind, after careful consideration of all aspects the Administrative Board of the Baruch Committee on Physical Medicine recommended to Mr. Bernard M. Baruch, the sponsor of the Committee, that a special grant be made to the Massachusetts Institute of Technology for the establishment of special courses in biophysics, as related to medicine, for qualified practitioners of medicine. This grant was made by Mr. Baruch to the Massachusetts Institute of Technology and courses which are free of tuition are now available at this institute for specially qualified young physicians who are interested in learning more about biophysics as related to the practice of medicine.

In order that the medical profession may be made cognizant of the reasons for the establishment of this course and that they may be given full information concerning the course, it has seemed advisable to prepare this communication.

During the course of our survey, I had the privilege of visiting, with the Chairman of our Research Committee, certain academic and commercial research laboratories, including the Department of Biology and Biological Engineering at Massachusetts Institute of Technology. What we saw opened our eyes with regard to the possibilities of electrophysics as related to medicine in the postwar world.

At one research center, there was a new 100,000,000 volt electron accelerator. This device provides high velocity electrons corresponding to voltages all the way from 2,000,000 to 100,000,000 volts. For comparison, radium radia-

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tions correspond to about 2,000,000 volts. This new device provides radiation right up to the edge of the cosmic rays and will open up a whole new field for investigation in the realm of physical medicine.

We learned more about the new electronic tubes which will provide microwaves which can be projected as a beam. It is now possible to provide ten kilowatts of high frequency power in wave lengths as short as 50 cm. or less. With these new electronic tubes, which can be obtained after the war, it will be possible to direct a beam of high frequency energy toward certain regions of the body. It is also possible to crossfire two or more such beams to obtain a high degree of localization of heat in a given bodily area. It will be possible to confine such a beam accurately and, for example, at a wave length of 20 cm., the beam would be localized on a spot of 5 cm. In other words, the diameter of the beam would be a fourth of the wave length.

A study of the effect of microwaves, as produced by these newer types of electronic tubes, in heating of human tissues will certainly be a fertile field for investigation.

We discussed with the noted physicist, Dr. Irving Langmuir, his studies on surface phenomena and protein solutions. These studies will have many biologic applications. Single layers of molecules can be detected, measured and their properties studied. One can detect extremely small amounts of substances in solution. Studies on the roentgenographic diffraction patterns of proteins promise to throw much light on the structure of the protein molecule. Dr. Langmuir believes that, although much more work is needed, it is merely a question of time before the problem is unraveled.

Once the true structure of the protein molecule is determined, protein chemistry will be revolutionized. Under favorable conditions, this problem may begin to yield within ten years. Investigations along this line should be part of the program of basic medical research. A whole world of mega-molecules and their unique properties will open before us. Langmuir expressed the opinion that eventually there will be a need for an "Institute of Mega-molecules." Roentgen ray and electron diffraction and electron microscopy will be employed chiefly at such an institute.

It was found, for example, that it is possible to make binaural hearing aids for deaf persons so that they could tell from which direction sounds were coming. With the currently employed monaural hearing aid, the deaf are unable to determine from which direction sounds emanate. Moreover, such binaural hearing aids permit discrimination between the sound source and reverberation and this is even more important than correction of directional defects.

Dr. Olson, an expert on acoustics, indicated that hearing aids might be made which would be operated from an ordinary alternating current household light socket. Such a device would be far superior to the small portable hearing aids now on the market because they might use directional type microphones and components having better acoustic performance. A person working for many

hours at a desk might well appreciate having such a better quality hearing aid to which he could connect a wire whenever he chose to do so, thus supplementing his portable device.

We were shown an electronic recorder which can measure accurately periods of time from one hundred-thousandth of a second up to many seconds. This can be used medically to study reaction times.

We studied a photo-electric spectro-photometer which measures reflectance transmission against wave length in millimicrons and records very accurately on paper the curves produced by various colors. This can be employed medically in the laboratory for study and solution of nearly all color problems and in making accurate color matching tests.

We observed a new integrating exposure meter which measures time against intensity of radiation. This device can be employed in connection with radiation therapy to make dosage much more accurate.

We saw new types of cathode ray oscillographs which are extremely useful in electro-medical research for studying the characteristics of electric circuits.

We examined experimental models of electron microscopes which had been so modified in size and construction that it was predicted that eventually we will have electron microscopes which will cost less than $5,000 and which will come in table models or will go into a suitcase.

We talked with Dr. Hillier who has contributed greatly to the development of the electron microscope. He showed us a table model of the electron microscope which would provide magnifications of 5,000 within the instrument of such definition that one can then obtain fifteen to twenty times more useful magnification by photographic enlargement so that one may still get a clear picture of an object which has been magnified as much as 100,000 times. The medical possibilities are almost beyond imagination.

Dr. Hillier showed us his electron microanalyzer, an electron microscope in conjunction with which a very small beam of electrons, which he calls an "electron probe," can be directed to small regions of the field being examined. The electronic energy absorbed by the substance which is being analyzed gives information about its chemical composition. Thus one can analyze extremely small microscopic substances. Hillier mentioned jokingly that, with this electron probe, it would be perfectly possible for one to write his signature on a bacterium. The diameter of the beam of the probe is only about twenty angstrom units. This analyzer may open other vast fields of medical physics.

We learned from radio engineers that amplifiers for the measurement of nerve impulses will be available which permit oscillographic recording of nerve currents with great fidelity of wave shape over a wide range of frequencies.

Dr. Brown, expert on high frequency currents, told us that there were great possibilities for quick sterilization of surgical instruments by means of high frequency coils. Very short periods of exposure to intense "shots" of power could be utilized. The method has already been utilized for quick sterilization

of drinking glasses. Intense sterilizing heat can be applied in a second or less. In "flash pasteurization" of milk, it can be heated by the high frequency current to a temperature of 190° F. in four-fifths of a second.

We may conclude then, I think, with Mr. Engstrom, a leading radio engineer, that what is needed is for physicians to make use of the physical tools which have already been developed. He said: "The main thing lacking is proper liaison between radio engineers and physicians." Physicians who are interested in research in physical medicine should become familiar with the field of modern electrophysics and then pick out the tools in the electric research laboratory which would be of value in therapy and in medical research.

In order to establish the proper liaison between radio engineers and physicians as suggested by Mr. Engstrom and to promote proper understanding between commercial and academic laboratories of research in biophysics and medical research workers and practitioners, the Massachusetts Institute of Technology has organized in its Department of Biology and Biological Engineering under the supervision of the Director of this department, Dr. Francis O. Schmitt, and under the immediate direction of Dr. K. S. Lion, a new program of training and research in physics and technology as applied in medicine. In order that physicians may know about this program, it is described herewith.

PROGRAM OF TRAINING AND RESEARCH IN PHYSICS AND TECHNOLOGY AS APPLIED IN MEDICINE

Purpose of the program.—This program was established at the request of the Baruch Committee on Physical Medicine for the purpose of providing training for physicians interested in entering and developing the field of physical medicine. Certain aspects of the program are the following:

1. To provide specialized and highly concentrated training in the physics and technology of the methods and equipment employed in the practice of physical medicine and in research in this and related fields.

2. To instill an understanding of the importance of the quantitative approach to clinical and research problems.

3. To stimulate selected Fellows to undertake investigations of limited scope along physical lines in the field of their particular interest.

4. To inform Fellows of the most efficient method of obtaining information from the literature, from prominent authorities and from industrial organizations, concerning technical problems they are likely to encounter in their future careers.

5. To gather bibliographic references in this field and to establish a central card index of the commercial instruments available, their physical characteristics and other pertinent data.

Details of the program.—Status of Fellows.—Fellows will be accepted by the Institute and listed as such in the records. They will have the privileges of library and athletic facilities which are extended to Fellows in the Graduate

School, including residence in the Graduate House if space is available. Since the Fellows will not be enrolled in regular classes, no grades, diplomas or certificates will be given.

Entrance dates and duration of course.—The curriculum, while somewhat informal, is set up for a period of three months beginning approximately on the first day of January, April, July and October. Some departure from these dates may occur, hence it is necessary that candidates ascertain the date for next admission. In some cases Fellows may stay for a longer period in order to study certain aspects in more detail or to engage in research.

The course will be given in the laboratories of the Department of Biology and Biological Engineering by Dr. K. S. Lion, Assistant Professor of Applied Biophysics. Inquiries concerning the course may be directed to Dr. Lion.

After a brief introduction period, in which the purpose and the arrangement of the course is described and the Fellow is given an opportunity to become acquainted with the staff and facilities, the course starts with a number of lectures in which the fundamental methods and instruments are described. The course is subdivided in twelve groups of "instrumentation elements."

These lectures are supplemented with demonstrations. The *practical* use of these elements is taught in the laboratory. Recitation periods permit discussion of practical questions (limits of applicability, commercial outfits or possible future development), supplemented by excursions. The biologic or medical applications are treated in a seminar, in which, to a certain extent, the Fellows "guide" the course. Included also are special lectures given by M. I. T. staff members and invited lecturers, together with evening discussions.

Subjects of the course in physics and technology in medicine.—1. Introduction.—Orientation and correlations in physics, biology, medicine, biophysics, physical medicine and biological engineering. Theoretical and experimental approach to instrumentation problems. Literature sources. Sensitivity, limits of accuracy in measurements and observations, dimensions, magnitudes, units.

2. General circuit theory.—Electric circuits, resistance, surface and volume resistance, skin and tissue resistance, inductance, capacity, dielectric properties, networks, filters, AC and DC measurements.

3. Electron tubes.—Introduction, rectifiers, DC currents and voltage sources, triodes, multi-electrode tubes, tube voltmeters, tube galvanometers, amplifiers, electrocardiographs, nerve action potentials and other biologic applications.

4. Electron tube applications.—Serve mechanisms, feed back, trigger circuits, constant voltage regulators, thyratrons, stimulators, impulse generators, cathode ray oscillographs, electron microscopy.

5. Oscillators.—Audiofrequency and high frequency, tissue impedance, magnetic and electric fields, depth effects, electrodes, field distribution, field measurement, dosimetry, voltage and current measurement at high frequencies, power absorption.

6. Meters.—Galvanometers, special meter types, technical voltmeters and ammeters, integrating and recording instruments, oscillographs, meter circuits, relay circuits.

7. Applied electrical measurements.—Ultramicrometers, time measurements, electric calculations, bridges, compensators, pH meters, polarographs, bridge indicators.

8. Nonlinear circuit elements.—Thermo-elements, resistance thermometers, detectors, dry rectifiers, piezo electricity, ionization.

9. Acoustics.—Elements and dimensions, decibel, phone, tone combination, binaural hearing, instruments, microphones, sound generator, filters, noise, supersonics, applications.

10. Optics.—Dimensions, units, spectral properties, reflections, refraction, polarization, scattering, ultraviolet and infra-red technics, physics of vision, light measurements, photography, photo-electric cells.

11. X-rays.—Generation and detection of radiation, tubes, x-ray kymography, cinematography, dosimetry, special technics, radioactivity, diagnostic and therapeutic applications, Geiger counters.

12. Special problems.—Temperature, humidity, pressure, atmospheric electricity, dust and airborne particles, meteorology.

CONCLUSIONS

During the course of the survey of the Baruch Committee on Physical Medicine, it became obvious that there was a need for a better understanding of biophysics as related to medicine on the part of physicians in general and particularly on the part of physicians proposing to do research or clinical practice in physical medicine. To meet this need, with the support of the Baruch Committee on Physical Medicine, the Massachusetts Institute of Technology has established a special program of training and research in physics and technology as applied in medicine which will be offered to qualified physicians and which, it is hoped, will develop on the part of the medical profession a better understanding of the great potentialities of the newer biophysical procedures which can be applied, not only in medical research but also in diagnosis and therapy.

Some Reflections on Medical Progress*

CHARLES S. KENNEDY
Professor of Surgery, Wayne University College of Medicine
Detroit, Michigan

Mr. President, members of the Board of Education, the Faculty, members of the graduating class, and friends: I find myself in a rather anomalous situation. For more than thirty years it has been my privilege on numerous occasions to speak to medical students on a great variety of subjects. They came, sat and listened, or slept briefly,—always more or less under compulsion. But now a modern miracle,—for this class, under no compulsion whatever, asks that I speak to them once more; perhaps, they secretly hope that it will be my swan song, at the end of which I will majestically sail away into the West to be seen and heard no more.

It seems fitting on an occasion such as this that one should take a glance into the past, appraise its successes and failures, and then turn an expectant gaze to the future so that a better day may be planned.

The past half century has seen amazing changes, geographically and culturally, in this nation, and the scientific advances in medicine have been even more astounding. At the turn of the century, this great city was little more than an overgrown country village. Horse drawn street cars clattered along Woodward Avenue and ended their trip in the countryside when Ferry Avenue was reached. The street was lined with the beautiful homes of the well-to-do, surrounded by spacious lawns and lovely gardens. Fine phaetons with spanking teams moved to and fro, and in the wintertime cutter races were held on Cass Avenue so that Mr. Daniel Campau might prove that his thoroughbred could show her heels to any rival in the town. A toll gate stood at the corner of Boulevard and Woodward and a corduroy road extended from that point to Palmer Park. Another toll gate was placed at Livernois and Michigan Avenues and a plank road was built from there to the old F. & P. M. Railroad. Many a time I have gathered mushrooms where the great Ford Rouge plant now stands. The site of the building in which you are now sitting was a pasture and an apple orchard, even so late as thirty years ago, occupied the land where the Museum of Art now stands. In these pastoral surroundings, life was serene and peaceful.

The automobile came and the genius of a few Fords and Knudsens, Lelands and Ketterings converted this city into the present teeming metropolis.

On the medical side at the turn of the century, the existence of "germs" had but shortly been discovered, Lord Lister had applied Pasteur's work to surgery, the horrors of hospital gangrene had nearly passed, the age of antiseptic surgery had come into its own, served its term of usefulness, and was passing to the era of aseptic surgery. The halls of the hospitals were high and

* Address given at the Commencement Exercises of the College of Medicine, June 25, 1945.

lofty, white and forbidding, reeked of the odors of carbolic acid and iodoform, and the institutions themselves were avoided as one avoids the plague because so many of those who walked in had to be carried out.

In the brief space of less than half a century, medicine and surgery made more progress than had been made in the preceding five thousand years. The strides of surgery, particularly, were tremendous. The abdomen was invaded, then the skull, the chest, the brain, and even the heart, with ever increasing safety. No cavity in the body escaped the peering eye of the surgeon, and no structure of the body his dextrous fingers or skillful and tender scalpel. America became the most scarified country on earth and Americans the most scarred. One would hesitate to ask a group such as this for a show of hands of those who have had operations lest the one or two unfortunate souls who have escaped would hide their faces in remorse or seek an unnecessary operation on the morrow.

On the medical side, analogous progress has been made. Typhoid fever used to run riot and is now a curiosity; diphtheria occurs rarely, the recent minor epidemic creating a furore; smallpox is seldom seen, tuberculosis, the "white plague," though still prevalent, has lost its terrors (and, by the way, perhaps some of you do not know that the development of the surgery of pulmonary tuberculosis owes more to Detroit than to any other city on earth). These and countless other contagious diseases have been brought under control by alert public health officers and their staffs.

In the field of general medicine, insulin controls diabetes; 606 diminishes the ravages of syphilis; antitoxins have abolished lockjaw, rabies is almost unheard of; pneumonia bows to the sulfa drugs and, lately penicillin and its associates adds one victim after another to the hoard of enemies which assailed man for centuries but are feared no more. When one adds to these accomplishments the benefits of X-ray, radium, hyperthermia, irradiated air and blood, blood transfusions, studies in fluid balance and countless other measures all directed to the purpose of prolonging life of man or to making that life more enjoyable, one realizes that the last fifty years have, indeed, been the golden age of medicine.

The results prove it. At the time of Christ, the average age of the people of Rome was 22 years. At the turn of the century, the average life expectancy of an American citizen was approximately 35 years. It is now over 60 years.

But what of the future? You may say that with all of those accomplishments, little remains to be done. The surface of medical possibilities has hardly been scratched. It is probably true that the skill of the surgeon will not show such vast improvement in the next fifty years as it has in the last half century. Doubtless, techniques will improve and mortality decrease, but the pace will be much slower than that of medicine. There is the field where still further marvels will be unearthed for the benefit of coming generations.

The biochemists are delving into the chemical structure of body cells and body fluids. Almost daily, new discoveries are being made and new concepts developed. No ordinary mortal, much less a surgeon, can hope to follow the kaleidoscopic changes but from it all the lot of man will be bettered. Perhaps

from all of this a glimpse at the answer to John B. Murphy's dictum that "The surgeons cut but God only heals" may come about.

The biochemist may have the answer to cancer in his test tubes. Certainly, the surgeon, with all his mutilating operations, excellent though they are in the present light of our knowledge, leaves much to be desired. But the biochemist,—here is the hope for a complete solution to the cancer problem if, in truth, one can be found. Dr. Clarence Cook Little is authority for the statement that seventeen million people in this country now living will die from cancer and that five million can be saved by surgery or other means if they will present themselves in time to a well trained doctor. What of the other twelve million and the endless millions to follow? The biochemist and his medical confreres in this field alone have an opportunity to enhance the welfare of mankind that beggars the imagination.

The psychiatrists make progress with the will and the emotions of man. Countless ages of heredity have at different times made man impulsive, headstrong, avaricious, unreliable, vindictive, cowardly and, withal, warlike. Perhaps, the ministrations of a few generations of psychiatrists may make him serene, agreeable, generous, dependable, charitable, courageous and peaceful all the time, or nearly all the time, as he is now on rare occasions; perhaps, under the tender ministrations of the psychiatrist the principles of the Sermon on the Mount will come to be the unwritten law of the land and even cantankerous man can glimpse eternity and the soul which animates his earthly frame.

At a recent dinner to Sir Alexander Fleming, Dr. Lescohier, distinguished business and scientific leader, said that "In the whole history of medicine, no discovery outranks or even equals that of penicillin." In the next few years, he predicted, more lives will be saved because of this monumental feat than have been lost in all of World War II. What a fertile field for development!

"The days of our years," says the psalmist, "are as of three-score years and ten." Though medicine has doubled the average length of life in fifty years, seventy continues to be a ripe old age and those who claim to reach one hundred are usually poor at arithmetic or have convenient memories. One of the next major problems of the doctors is to add fifty or a hundred years to the accepted three score and ten. Most of us,—at least on the platform, were born a bit too early to participate in these prospective benefits. It has well been said that a man is as old as his arteries. To alter man's heredity of sixteen or sixty million years and to supply him with arteries which will endure indefinitely or to preserve those arteries with which man is now endowed from attacks from worry, disease and the various other poisons by which man is beset, is the opportunity and the duty of future generations of doctors. Greater opportunities, together with the tools at hand, by which man's destiny may be fulfilled have never been available to the profession.

In order that many of these much-to-be-desired ends may here be attained, a somewhat different approach to the problem—man—must be made. First, there must be an improved laboratory in which the genus *Homo sapiens* to-

gether with his difficulties, mental and physical, may be appraised, analyzed, diagnosed and treated. Such splendid laboratories have sprung up over the wide stretches of this land that today the universities, hospitals and research institutions in our country are unexcelled and seldom equalled anywhere. In the not too distant future, within a stone's throw of this building, will rise a series of university buildings including a hospital and various academic research halls which will make our beloved city a mecca for the undergraduate student as well as for those interested in research or postgraduate training, especially in the field of industrial medicine.

When those dream buildings are constructed and the halls filled with earnest teachers and eager students, what may not be accomplished? No one can now be an authority on all phases of disease, or scarcely even one, but when a great university is collaborating on a problem so that the knowledge of the internist and the surgeon, the bacteriologist and the pathologist, the biochemist, physicist, physiologist and the psychiatrist, together with a score of other experts in various fields,—when all of these, I say, can be turned loose on one problem, something good for the welfare of mankind is bound to eventuate. This to me seems to be one of the main goals of the university. Each man must have his own individual problem but in many instances it should be the aim of university accomplishment, as Mr. Kettering pointed out some time since, to turn all of the available big guns on one problem and annihilate it. Detroit led the way in the great automobile industry by this technique and it should likewise blaze the trail for medicine in the last half of the 20th century in similar fashion. With the facilities at hand, the future of Wayne University Medical School looks brilliant.

Under the skillful guidance of Dr. Henry, together with the sympathetic and understanding leadership of the Board of Education, these brilliant prospects will presently be achieved. Added impetus will be given to this movement when our own Base Hospitals 17 and 36 return to the paths of peace. The splendid training and energy which they applied to the fine contributions they have made to the preservation of freedom can presently be devoted to furthering the interests of a better life at home. Sixty-three out of sixty-six of your number, an amazing total, will, if the war continues, soon be leaving to aid in bringing this horrible war to a victorious conclusion. When you return, you too will cooperate with your older companions in arms in a united effort to help your University build a great medical center where the ills of suffering mankind may be ameliorated and the better life may be evolved. All men of good will will join you in this endeavor.

Finally, on occasions such as this, it has been my observation that the speaker is always expected to make some wise remarks and give some sound advice. One may observe that wisdom results from a meticulous blending of knowledge and experience. Knowledge many times finds its possessor living seclusively in an ivory tower or wandering through the campus with his head in the clouds, looking down upon the other creatures on this earth with Olympian disdain. Experience, on the other hand, often allocates to itself a sense of complete self satis-

faction in practical accomplishment and looks with bovine indifference on the finer things of life. A happy combination of these two elements, essential to useful and gracious living, results in the better life. Few of us ever attain any great degree of wisdom but it is a goal to be striven for by the educated physician and gentleman. The pages of the medical history of Wayne University contain the names of Theodore McGraw, Angus McLean, Don Campbell, and the late Andrew P. Biddle and William Donald, to mention only a few of the wise guardians of the public health of their time. Their examples may well be emulated.

In the attainment of a modicum of wisdom, together with a bit of satisfaction in attaining it, years of well directed effort are required. An ancient philosopher said: "Man earns his bread by the sweat of his brow." It is well that this is everlastingly true despite some recent efforts to alter the premise. Man earns his bread by the sweat of his brow and retires to slumber deeply, weary but happy in the knowledge of a decent day's work. Do not be afraid to work. Constructive effort is one of God's finest gifts to man.

Do not try to get rich, as the main objective of your labors, because, in the first place, it cannot be done unless you marry a rich wife—and if, perchance, without the aid of connubial bliss you attain great fortune, it is at a greater cost than the result justifies.

Do not be afraid to play. Constant and unrelenting attention to medicine kills all of the other sparks of gracious living in too many doctors so that they become intolerable bores. How can any one at a great play or while listening to a great orchestra or even in the intimate chat of the dinner table constantly hash over the day's grist of appendices?

Join medical societies and attend them regularly. Such contacts renew and freshen your interest in medicine, establish social contacts with life long possibilities, give you a source of self expression and furnish you with new ideas of diagnosis and treatment for the benefit of your patients who are in the last analysis your life's work and your greatest concern.

Take an interest in your government. In simple gratitude you owe it much. Countless millions at this moment would give half of their years to change places with you.

And lastly, in the words of the poet, "To thine own self be true and thou canst not then be false to any man."

Report of the Committee on Internships of the Association of American Medical Colleges

The Chairman reported that the agreement entered into in Detroit by the Association while not observed completely by a few medical schools and hospitals, had been followed by most of the institutions in the country and had resulted in a very great advance in bringing order out of a chaotic situation. The advantage of this year's experience, it is anticipated, will bring about full cooperation during the coming year. The essential ingredients of this advance were the participation in the agreement by the Association, the American Medical Association and the three national hospital associations with consequent assumption of responsibility by the parties concerned.

A PROPOSAL TO REVISE THE EDUCATIONAL CRITERIA FOR AN INTERNSHIP ACCEPTABLE TO THE MEDICAL SCHOOLS

This proved to be not feasible during the prevalence of wartime shortages of personnel. However, it was reported that the New York Committee for the Study of Hospital Internships and Residencies has secured a grant from the Commonwealth Fund to undertake a two year experimental project in two non-teaching hospitals to set up a teaching program for house staffs similar to university hospitals, under the supervision of half time directors of house staff education. Subsequent reports will be made to the Association concerning the results obtained.

DATE FOR RELEASE OF APPLICATION AND CREDENTIALS FOR INTERNSHIP APPLICANTS

Applications and credentials for internships to begin by July 1, 1947, shall not be released by the medical schools nor received by the hospitals before June 1, 1946.

ACCEPTANCE DATE

Hospitals shall not issue the acceptances of interns, either written or verbal, before July 1, 1946.

DECISION DATE BY INTERNS

The prospective intern's acceptance or rejection of such appointment shall reach the hospital on or before July 8, 1946.

PROPOSED UNIFORM APPLICATION BLANK

A proposed uniform application blank was submitted by a special subcommittee composed of Mr. E. I. Erickson, American Protestant Hospital Association; Rev. J. W. Barrett, Catholic Hospital Association; Dr. H. V. Hullerman, American Hospital Association, and Dr. J. A. Curran (Ex Officio), Association of American Medical Colleges.

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Applicants for 1946

Unofficial reports from medical colleges indicate that many veterans and men soon to be discharged are applying for admission to medical schools. Data are not at hand to show that this is true in all medical schools. One school has had 3,000 applications; another 1,600; another 1,000. It is too early in the year to make an inquiry of all medical schools as to the number of applications received. If all schools report a high application record, the total number of applications will exceed all previous records. However, doubtless the number of multiple applications will be large. The number of acceptances necessarily must be limited by facilities, especially clinical facilities.

This urge to study medicine is probably activated by a current belief that there is a shortage of physicians. True, there is a shortage in small communities but certainly not in large communities. It is, therefore, not an actual shortage. It is a matter of unequal distribution which has always been a problem. The physician-population ratio is smaller in the United States as a whole than in any other country. In many local areas it is high, but not in areas in which there are many centers with large population. Can an adjustment be made which will bring about a more equal distribution of physicians than is now the case? Can anything be done to persuade young graduates to set up in practice in a small community?

Naturally, graduates prefer to settle where there are the facilities they want and which they feel they must have if they are to practice good medicine. But, are they aware that, after all, they must have sufficient self reliance on their ability to practice good medicine? True, adequate hospital facilities play a large role in the choice of a location. Medical students are taught to depend on many aids other than real knowledge of medicine in practice. Is medical education at fault? Is too much stress laid on laboratory reports and other aids in diagnosis? Are medical students taught sufficient self reliance on what they have to know about diseases and how to treat them without ancillary aids? Are they taught to do for themselves what they believe others must do for them?

There are many physicians in small communities who are practicing good medicine. They have provided themselves with all the facilities needed for good practice. They are entirely self reliant. Of course, financial returns enter into the picture of selection of a location to practice. If medical students were given an opportunity to learn that often a country practice brings larger financial returns than does a city practice, more of them would locate in small communities than is now the case. Why not include in their education a short stay—say, three months—with a country practitioner? It would be an invaluable experience and it may help to solve the problem of unequal distribution of physicians and overcome the belief that there is a shortage of physicians.

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A School for Deans

Reports made by the secretary of the Association of American Medical Colleges at annual meetings for a number of years have shown that there is a large turnover in deanships every year. Deans die and deans retire. The job has become a very trying one. The demands on the time and energy of a dean are terrific. The strain on his stamina is

more than he can stand. One result is that a deanship is more and more a full time job. Medical educators have known this for a long time. Faculty members who are taken from a department to act as dean, realize soon that they can devote little, if any, time to their former activity, hence contact with it is soon lost.

Where can a competent full time dean be found? There are many vacancies in deanships now. Should there be an educational center for deans? Is it possible for every medical school to select some one of its faculty and educate him to become a dean? Something must be done to create a pool from which good deans can be drawn. A dean must be more than a good administrator or business executive. He must be well versed in the many aspects of medical education. Many years of experience and training under a competent dean are needed before entering on a deanship.

Since the 1945 meeting of the Association of American Medical Colleges—six months ago—three deans have died; seven have resigned or retired; six new deans have been appointed. At that meeting it was reported that 17 new deans were appointed. There are now at least half a dozen vacancies in deanships. Is it not, then, well to think of a school for deans so that competent men will be available to fill these vacancies and many more that will occur soon?

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The Association Journal

The JOURNAL is the only publication of its kind. It is devoted entirely to medical education and teaching. It is the "trade" journal of the medical teachers numbering about 17,000 in the United States and Canada. Almost 5,000 receive the JOURNAL, without charge, by reason of their faculty membership. It may also be received by subscription. By order of the Executive Council, every medical school in membership in the Association is entitled to receive 50 copies of each issue. These copies are sent to college personnel whose names are submitted by the college. It is the wish of the Association that every faculty member of professorial rank who is desirious of receiving the JOURNAL be on the mailing list. The cost of publication is so high that restriction must be placed on the number of copies printed, hence the limit of 50 for each school.

The papers published include, first, those read at the annual meeting; second, acceptable volunteer papers. They must deal with some phase of medical education and teaching. Third, reports on studies made by the Association are published from time to time. The JOURNAL is the only medium which presents this information of vital importance to medical education and it is the only medium which reaches the medical teachers, many of whom are not physicians, hence are not apt to seek information of interest to them in a medical journal.

The mailing list is now being submitted to the medical schools for revision. All those who wish to receive the JOURNAL should make certain that their name is on the list.

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The 1946 Meeting

It became necessary to rescind the action taken at the Pittsburgh meeting which designated New Orleans as the place for holding the 1946 annual meeting of the Association. The facilities needed are not available this year. The Executive Council has decided to depart from a custom followed for many years, namely, to have a member college be host. This action is in the nature of an experiment. Arranging a good program for the meeting is quite a task. Those who participate in it deserve receiving full attention and ample time for the presentation of their papers. Then, too, time must be available for discussion. These aims can only be achieved if full time is given to the sessions. Therefore, the Executive Council, acting in an emergency, has decided to select for the meeting a resort place. Many such places have been contacted. A selection will be made by the Executive Council when it meets in Chicago June 9th.

College News

University of Texas
Medical Branch

The Galveston State Psychopathic Hospital was reopened with a special ceremony on March 7, 1946, with an address by Dr. Franklin G. Ebaugh, Professor of Psychiatry at the University of Colorado.

A feature of the Thirteenth Annual Conference of the Texas Society for Mental Hygiene held in Galveston March 7 and 8, 1946, was a session devoted to psychiatry in industry. Contributing to the program were Dr. Lydia G. Giberson of the Metropolitan Life Insurance Company, and Dr. T. M. Frank, industrial physician, Pan American Oil Company. Dr. Harold Rusk, special consultant to the Baruch Committee for Physical Medicine, outlined a program for a comprehensive community rehabilitation center. Members of the staff who participated were Dr. Titus Harris, professor of neuropsychiatry, Dr. Hamilton F. Ford, professor of neuropsychiatry, and Dr. Jack H. Ewalt, professor of neuropsychiatry.

A pioneer conference on physical medicine was held March 4-7, 1946, under the direction of W. A. Selle, Ph.D., professor of physiology. Guest speakers included Dr. R. L. Bennett, director of physical medicine, Georgia Warm Springs Foundation; Mr. J. J. Brown, director Vocational Rehabilitation Service; Dr. R. K. Daily, professor of clinical ophthalmology, Baylor University; Captain R. F. Dow, M.C., chief of physical medicine, Army and Navy Hospital, Hot Springs, Arkansas; Major A. B. C. Knudson, M.C., assistant chief of physical medicine, Veterans' Administration; Dr. Richard Kovacs, professor of physical medicine, New York Polyclinic; Dr. Frank Krusen, professor of physical medicine, Mayo Foundation, and director of Baruch Committee on Physical Medicine; Dr. Joseph Molner, medical director, Detroit Department of Health; Captain A. M. Pruce, M.C., Lawson General Hospital, Atlanta; Dr. Howard Rusk, consultant on rehabilitation, Baruch Committee on Physical Medicine; Mr. James L. Tenney, Crippled Children Division, Texas State Board of Health.

A grant of $5,000 has been given by the C. R. Roerig Company of Chicago to support the research of Dr. C. M. Pomerat, Ph.D., director of the Tissue Culture Laboratory.

Cecil H. Cornell, D.V.M., formerly on the staff of Texas Agricultural and Mechanical College and recently returned from war duty, has been appointed assistant professor of preventive medicine.

Dr. Charles A. Doan, professor of medicine and dean of State University of Ohio School of Medicine, recently gave a series of clinics and conferences on the function of the spleen in health and disease, and also on acute blood disorders.

Dr. Wesley W. Spink, professor of medicine of the University of Minnesota, recently conducted a series of conferences on streptococcal and staphylococcal infections.

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Bowman Gray
School of Medicine

The Board of Trustees of Wake Forest College acted favorably on an offer from the Z. Smith Reynolds Foundation of an endowment fund with a market value of $10,500,000. The charter of the Foundation provides that 20 per cent of the income be added to the principal until through this and other contributions it reaches $50,000,000. The offer stipulated that Wake Forest College be moved to Winston-Salem, where the Bowman Gray School of Medicine of Wake Forest College and the North Carolina Baptist Hospital are now located. Final decision in the matter will

be made by the North Carolina Baptist State Convention. A gift of $125,000 has been received from Gordon Gray, son of the late Bowman Gray. The greater portion of the gift will be used to develop a department of psychiatry. Dr. Lloyd J. Thompson, formerly a member of the staff of the department of psychiatry of Yale University School of Medicine, has been elected professor of psychiatry and director of the department of neuropsychiatry. Dr. J. P. Davis, Charles H. Reid, Jr., and Joseph B. Stevens have been appointed to the staff with the title of assistant in medicine. The fourth commencement was held on March 24. Forty-two graduates were awarded the degree of Doctor of Medicine. Dr. Thomas T. Mackie of New York delivered the commencement address.

Dr. Robert P. Morehead, associate professor of pathology and director of the department, has been appointed educational director of the North Carolina division of the field army of the American Cancer Society.

The school recently received $125,000 from Mr. Bowman Gray, Jr., matching a similar amount recently given to the school by his brother, Mr. Gordon Gray. Both gifts are unrestricted in their use. A Department of Preventive Medicine has been organized, and Dr. Thomas T. Mackie of New York has been elected Professor of Preventive Medicine and Chairman of the Division of Medicine. Dr. John H. Ferguson, Professor of Physiology at the University of North Carolina School of Medicine, addressed the Bowman Gray Medical Society on April 15, 1946. His subject was: "Blood Coagulation and Modern Clinical Applications."

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Jefferson Medical College

The One Hundred and Twenty-second Annual Commencement was held on March 27, 1946. The commencement address was delivered by Dr. Brooks M. Anspach, emeritus professor of gynecology, Jefferson Medical College, on "Life, Liberty and the Pursuit of Happiness." The Honorary Degree of Doctor of Science was conferred upon Dr. Anspach. The present graduating class of 155 members brings the total number of graduates up to 17,664 during the 122 years of its existence.

The graduating class of 1946 presented a portrait of Dr. George P. Muller, Grace Revere Osler Professor of Surgery, to the College. Dr. Muller's resignation became effective March 27, 1946.

Dr. Eugene M. Landis, George Higginson professor of physiology, Harvard Medical School, gave the annual Alpha Omega Alpha Lecture January 16. His subject was "Venous Pressure and Cardiac Failure in the Laboratory and Clinic."

Dr. John H. Gibbon, Jr., assistant professor of surgery, University of Pennsylvania School of Medicine, has been appointed professor of surgery and director of surgical research at the Jefferson Medical College. He will succeed Dr. George P. Muller, Grace Revere Osler professor of surgery, who retired.

Dr. Thaddeus L. Montgomery, professor of obstetrics and gynecology and head of the department at Temple University School of Medicine and Hospital, has been appointed to a similar position at Jefferson. He succeeds Dr. Norris W. Vaux, whose retirement became effective at the end of the school term in March. Dr. Montgomery will devote his major teaching to obstetrics but will continue his practice and participation in gynecology. The department of gynecology and the department of obstetrics will be combined in one department with Dr. Lewis C. Scheffey, professor of gynecology since 1940, as head of the department, professor of obstetrics and gynecology, and director of the division of gynecology.

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Southwestern Medical College

A section of the permanent building of the proposed college, to be built on Harry Hines Boulevard, will be known

as the Braniff Research Laboratories, which was made possible through a recent $100,000 gift of the Braniff Foundation. The Braniff Foundation was established in 1943 for the purpose of advancing educational, charitable and religious institutions and to aid in the promotion of systems of scientific research. It is headed by Tom E. Braniff, president of Braniff Airways. The section provided by this fund will house the research work of Drs. Arthur Grollman, Warren B. Andrews, Tinsley R. Harrison and Simon Edward Sulkin, Ph.D., all of Dallas. The Hoblitzelle Foundation has given $125,000 to the Southwestern Medical Foundation to make possible the purchase of about 62 acres of land on Harry Hines Boulevard, on which the permanent buildings of Southwestern Medical College will be built. The land was given as a memorial to the late Mrs. Esther Thomas Hoblitzelie, wife of Karl Hoblitzelle, who founded the Hoblitzelle Foundation, which had its inception as a public welfare institution in December, 1942. Serving with Umphrey Lee, Ph.D., Dallas, as trustees of the foundation are Judge Sara T. Hughes, Mrs. Earl H. Hulsey, Fred F. Florence and Karl Hoblitzelle. A suitable marker will be placed on the grounds of the college in honor of the late Mrs. Hoblitzelle.

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Northwestern University Medical School

A plan of development, emphasizing, among other things, the need for increased research in medicine, has been announced. The program, to extend over a period of 25 years, calls for the raising of between $95,000,000 and $150,000,000, to erect on the Chicago campus of the university 16 new buildings and to provide a large endowment for research and teaching. Top listing is given to medical research. Ten buildings and endowment for fellowships, libraries and a staff of brilliant medical investigators are the major part of the whole project. It will require from $63,000,000 to $95,000,000. An Institute of Medical Research will be housed in a 20 story building. In addition the institute will vastly increase its effectiveness in research through its close association with other developments in the projected medical center. These include a Neuropsychiatric Clinic, a Cancer Clinic, a Urological Institute, an Eye Hospital, a Women's Hospital, a School of Nursing, a Children's Hospital, a University Clinic, and an expansion of a General Hospital. These nine buildings, which will be erected on the campus will require an expenditure of $16,800,000. Large endowments will be required to maintain the buildings and provide the best possible staff for teaching and research. Of these sums approximately $1,500,000 is now available for the Neuropsychiatric Clinic through a bequest from the late Mrs. Joy Morton.

A department of ophthalmology has received an additional gift of $4,000 to the Sanford R. Gifford Memorial Fund from Mr. Bernard Spero, president of the House of Vision. Mr. Spero had made an earlier donation of $1,000. It is proposed to use this sum to establish a fellowship in research and teaching of refraction and allied subjects to young ophthalmologists. The memorial fund was established in 1944 by friends and associates of Dr. Sanford R. Gifford shortly after his death.

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Long Island College of Medicine

In tribute to his forty-eight years in medicine and his contributions in the field of urology, Dr. Nathaniel Phillips Rathbun was presented with the Alumni Medallion for distinguished service to American medicine at the 88th commencement exercises of the college.

Dr. Rathbun has distinguished himself as a leader in urology for the past thirty years as chief of the Urologic Service of Brooklyn Hospital and as consultant urologist at several other hospitals.

Gifts and grants totaling $143,437 were made to the Long Island College of Medicine, Brooklyn, during the year ended January 1, exceeding by $16,063

contributions received during the previous year. These contributions, not including increments in the endowment of the college, fall into six categories: general, $84,066; memorials and scholarships, $2,503; teaching, $21,904; research, $23,173; fellowships, $2,000, and prizes, $75. The development fund, from which a total of $63,662 was utilized during the calendar year 1945, represents the largest amount received. The Commonwealth Fund gave the second largest amount. It contributed $20,304 to the department of psychiatry. To establish this department the Commonwealth Fund made a six year grant, which started in 1943 with a contribution of $5,112. This department, named after the late Dr. William Alanson White, graduate of the college in the class of 1891, is now located in a new building at 88 Amity Street.

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University of Vermont
College of Medicine

Promotions: Dr. Wilhelm Raab, formerly assistant professor of clinical medicine, appointed professor of experimental medicine. Dr. Paul French, formerly associate professor of clinical medicine, appointed professor of clinical medicine. Dr. Walford Rees, formerly assistant professor of surgery, appointed professor of clinical surgery.

New Appointments: Dr. R. M. Peardon Donaghy, associate professor of neurosurgery; Dr. John P. Marbarger, formerly with the AAF, to instructor in physiology; Dr. Paul G. LeFevre, instructor in physiology; Dr. Thomas Morrione, formerly instructor in pathology, Long Island College of Medicine, to assistant professor of pathology; Dr. Ernest Stark, formerly instructor in pathology, Tulane University School of Medicine, to assistant professor of pathology; Dr. William van Bogaert Robertson to assistant professor of experimental medicine; Dr. R. F. Krause, formerly with the AAF, to research associate in biochemistry; Dr. Edwin E. Hays, formerly instructor in biochemistry, St. Louis University, to assistant professor of biochemistry.

Boston University
School of Medicine

Dr. William Malamud has been appointed professor of psychiatry and chairman of the department. The university will undertake a program of undergraduate instruction in this field that will meet the need for providing medical students with a more extensive training. An anonymous gift of $30,000 has made possible the expansion of this part of the instructional program. Dr. Malamud will inaugurate a program of undergraduate training in psychiatry which will be carried on throughout all four years of the medical school course. Special emphasis will be placed on giving the students an increased opportunity to receive training in the diagnosis and management of the neuroses. Dr. Malamud, who will assume his duties at the beginning of the next school year on July 1, has been professor of clinical psychiatry at Boston University. Dr. Malamud has been clinical director and director of research at the Worcester State Hospital. He served as professor of psychiatry at the State University of Iowa College of Medicine from 1929 to 1939.

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New York University
College of Medicine

Four hundred medical veterans, one third of them alumni, are enrolled in the Postgraduate Division of the College. These courses are taught in the New York University Division of Bellevue Hospital and other hospitals affiliated with the university. Refresher and review courses are offered as well as courses arranged for those who plan to acquire certification from a specialty board. Former interns, whose internship was curtailed by the accelerated wartime program, will be given an opportunity to enter on an internship to prepare them for practice or a residency. This extensive program has been made possible by a grant of $50,000 a year, for three years, from the W. K. Kellogg Foundation.

Thirty-five friends and associates of

the late Dr. Mills Sturtevant, who founded the gastro-enterology clinic of the college in 1926, decided to raise $100,000 to build, equip and endow a new stomach clinic in his memory. The new clinic will be part of the New York University-Bellevue Medical Center in the Bellevue area, of which New York University's section will cost $15,000,000. Dr. Sturtevant was on the New York University medical staff from 1913 until his death in 1945 and chief of the gastro-enterology clinic until 1938.

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University of Illinois
College of Medicine

A one week didactic and clinical refresher course in otolaryngology has been arranged for specialists in the field, from May 13 to 18, 1946, inclusive. Applications for registration should include school of graduation, training and experience. Check for tuition ($50.00) should accompany the application. In addition, a special course in bronchoesophagology will be given from June 3 to 15, 1946, inclusive. It will consist of lectures, animal and cadaver demonstrations, diagnostic and surgical clinics. The course will be under the direction of Drs. Paul H. Holinger and Albert H. Andrews, Jr. Tuition for this course is $100.00. Check should accompany application. Class limited to twelve physicians.

For further information address: Department of Otolaryngology, University of Illinois College of Medicine, 1853 West Polk Street, Chicago 12, Illinois.

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Western Reserve University
School of Medicine

Dr. Harland G. Wood, associate professor of physiological chemistry, will head the department of biochemistry, which recently received a $500,000 gift for expanding its operations.

He will succeed Dr. Victor C. Myers, who has been named head of the newly created department of clinical biochemistry at the School of Medicine.

University of Louisville
School of Medicine

Miss Juanita Phillips, Stearns High School teacher, is the first applicant to be accepted for a scholarship under the Kentucky Medical Scholarship Fund, newspapers report. Miss Phillips will receive a four year scholarship to the School of Medicine. The scholarship carries a loan of about $3,500 from the Kentucky Medical Scholarship Fund, set up by the Kentucky State Medical Association to provide medical facilities to make rural counties more attractive for practicing physicians and to enable students to complete their training. Miss Phillips, in accordance with the agreement, will, on receiving her M.D. degree and concluding her internship, return to McCreary County for four years for the practice of medicine. The state legislature has been asked to set aside a revolving fund of $75,000 to help maintain the project.

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University of Chicago
Medical School

Dr. David Slight will resign June 30 as professor and head of the department of psychiatry, where he is now on sabbatical leave, and will direct a statewide system of rehabilitation centers planned under the new division of veterans' rehabilitation centers, which will be a part of the public welfare department.

Dr. Richard S. Farr, Highland Park, Mich., has been granted the $500 Borden Undergraduate Research Award. Dr. Farr graduated at the medical school March 22 and was granted the award for his paper on experiments on the fate of the transfused leukocyte. A lieutenant (jg) in the U. S. Navy Medical Corps, Dr. Farr will take a naval internship. The award is one of a group that were established in various medical schools.

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Cornell University
Medical College

The Marcelle Fleischmann Foundation has made a grant of $20,000 a year for a ten year period to the depart-

ment of public health and preventive medicine for the study of tropical disease. The specified purpose of the gift is to promote the study of immunologic and allergic manifestations of exotic diseases and to provide for a better understanding of their prevention and treatment. The investigations at Cornell will be under the direction of Morton C. Kahn, Sc.D., associate professor of public health and preventive medicine at Cornell. The Marcelle Fleischmann Foundation is a philanthropy that has been founded recently by Mr. E. M. Fleischmann, Baltimore, in memory of his late wife.

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University of California
Medical School

The Jewish Fund for Medical Research has given $40,000 to the University of California for cancer research on the Los Angeles campus. Part of the fund will be used for a special building on the Los Angeles campus and will be designed to facilitate expansion of a cancer research project already in progress and results of which are pronounced "encouraging" by Harry S. Penn, research associate in zoology, who is directing the work. The Jewish Fund for Cancer Research was incorporated June 28, 1943, under the laws of the District of Columbia. The trustees are Edmond I. Kaufmann, Cecil D. Kaufmann and Marcus S. Goldnamer, all of Washington, D. C. The work sponsored by the fund has been in progress by the university about two years.

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Ohio State University
College of Medicine

Dr. N. Paul Hudson, professor and chairman of the department of bacteriology and the university graduate school, has been named dean of the graduate school to succeed Alpheus W. Smith, Ph.D., who will retire August 31. Dr. Hudson, who graduated at Harvard Medical School, Boston, in 1925, has served at different times as instructor at the University of Chicago, assistant pathologist, Boston City Hospital, field director in yellow fever with the International Health Division, Rockefeller Foundation, West Africa, and professor of bacteriology and hygiene at the University of Chicago. He has been associated with the Ohio State University since 1935.

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Loyola University
School of Medicine

The president of the university has announced that a current rumor that the School of Medicine will be closed is unfounded. The school not only will not close, but it is now making plans for erecting a new building in the West Side (of Chicago) Medical Center in or near its present location. The university is making quite extensive plans for this new development.

Samuel Cardinal Stritch, Archbishop of Chicago, has promised to provide $50,000 a year to aid Loyola University School of Medicine if the Alumni Association will raise an annual sustaining fund of a similar amount. The Archbishop's support is to continue until the endowment fund has reached its goal and is able to maintain the school.

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University of Cincinnati
School of Medicine

Dr. Burr N. Carter, recently assistant to the chief surgical consultant in the office of the surgeon general, was named professor of surgery, succeeding the late Dr. Mont R. Reid. Dr. Albert B. Sabin was promoted from associate professor to full professor of research pediatrics. Joseph L. Schwind, Ph.D., associate professor of anatomy, Albany Medical College, has been named chairman of the department of anatomy, succeeding Dr. Edward F. Malone, resigned.

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Louisiana State University
School of Medicine

Dr. George M. Haik has been appointed professor of ophthalmology to succeed the late Dr. Theodore J. Dimitry.

Emory University
School of Medicine

Dr. Daniel C. Elkin has returned to his position as the Joseph B. Whitehead professor of surgery. Dr. Elkin has been in military service. New appointments to the faculty include Drs. Frank L. Engel, New Haven, Conn., associate professor of medicine; Max Michael, Jr., Athens, assistant professor of medicine; Harry L. Allen, Jr., Fort Myers, Fla., assistant professor of anatomy; Albert L. Evans, Sandersville, William P. Leonard, Jr., Atlanta, and Virgin D. Shepard, Rochester, Minn., all assistant professors in the department of surgery; James T. King, Quitman, and Buford L. O'Neal, Shreveport, La., assistant professors in clinical otorhinolaryngology.

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Tulane University of Louisiana
School of Medicine

The Tulane University of Louisiana Medical School, New Orleans, has been left $100,000 by the late Dr. Henry E. Menage. The fund will be called the Henry E. and Henrietta Menage Research Fund in Dermatology and will be used for medical research on the causes, prevention and cure of diseases of the skin.

The medical research division of Sharp and Dohme, Inc., Glenolden, Pa., has given $5,000 to Tulane to be used in the continuation of research on sulfathalidine and tyrothricin, under the direction of Dr. Chapman G. Johnson, assistant professor of gynecology and obstetrics.

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Indiana University
School of Medicine

Dr. John L. Arbogast, recently released from service in the army, has been named director of the clinical laboratory to succeed Dr. Clyde G. Culbertson, who resigned to become a member of the research staff of Eli Lilly and Company. Mr. Edmund J. Shea, recently released from the army, has returned to the center as assistant administrator.

University of South Dakota
School of Medicine

H. Morrow Sweeney, Ph.D., professor and head of the department of physiology and pharmacology, on leave of abscence since 1943, expects to return to the School of Medicine in June of this year in his former capacity. Professor Sweeney is chief of the biophysics branch of the Aero Medical Laboratories of the Air Technical Service Command at Wrights Field. Much of his research has been of a high caliber. He gained a wide reputation for his studies on Explosive Decompression.

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University of Kansas
School of Medicine

Dr. Melvin H. Knisely, associate professor of anatomy of the University of Chicago, gave the 9th Annual Nobel Pierce Sherwood lectureship March 29, 1946. His subject was "Intravascular Agglutination of Blood in Disease." This lectureship is sponsored by the local chapter of Phi Beta Pi.

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Medical College of the
State of South Carolina

The South Carolina Legislature has passed a bill appropriating to the Medical College $1,500,000.00 for the construction of a teaching hospital. This is contingent upon Federal matching as contemplated in the Hill-Burton Bill.

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University of Rochester
School of Medicine

Dr. John Romano, University of Cincinnati College of Medicine psychiatrist and director of the department of psychiatry of the Cincinnati General Hospital, has been appointed professor of psychiatry.

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University of Buffalo
School of Medicine

Dr. Archibald S. Dean, district state health director, has been appointed acting head of the department of hygiene and public health.

Temple University
School of Medicine

New Appointments: Dr. George C. Henry, professor and head of the department of physics; Dr. Margaret C. Collins, director of laboratories and lecturer in endocrinology. Dr. Theodore L. Chase has increased his contribution to $1,000,000 for the department of surgical research.

Dr. Lawrence W. Smith has resigned as professor of pathology, to become medical director of the Commercial Solvents Corporation, New York.

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University of Nebraska
College of Medicine

Dr. Harold C. Lueth, assistant professor of medicine, University of Illinois College of Medicine, has been appointed dean to succeed Dr. C. W. M. Poynter, who becomes dean emeritus. Dr. Lueth will also serve as professor of medicine and superintendent of the University Hospital.

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Tufts College Medical School

Dr. Dwight O'Hara, professor of preventive medicine, has been made dean. He has been acting dean for the past four years while Dr. Albert W. Stearns was on leave to the Navy Medical Corps. Dr. Stearns recently became head of the new department of applied sociology in the Tufts School of Liberal Arts.

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Duke University
School of Medicine

The Borden Undergraduate Research Award in Medicine for 1946 was given to Dr. Thomas Howard Lewis, with Honorable Mention to Dr. Alexander W. Boone, Jr. The E. Mead Johnson Prize in pediatrics was awarded to Dr. Bailey Daniel Webb.

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University of Minnesota
Medical School

At the recent meeting of the American Association for Cancer Research, held in Atlantic City, Dr. John J. Bittner, who holds the George Chase Christian Professorship of Cancer Biology in the Medical School, was elected vice-president of the association.

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University of Wisconsin
Medical School

The nineteenth William Snow Miller Lecture, sponsored by Alpha Pi of Phi Beta Pi, was delivered April 1 by Olof Larsell, Ph.D., professor of anatomy, University of Oregon Medical School. His subject was "The Anatomy of the Cerebellum as Related to Function."

General News

Hoffmann-La Roche, Inc.

Dr. Leopold Ruzicka, winner of the 1939 Nobel Prize in Chemistry, and Dr. Tadeus Reichstein, the first man to synthesize vitamin C, who are here to study American scientific developments, recently visited the Roche Research Laboratories of Hoffmann-La Roche, Inc., pharmaceutical manufacturers of Nutley, N. J. Drs. Ruzicka and Reichstein will visit other leading research institutions and lecture before many scientific groups during their six to eight weeks' stay in the United States. These two famous Swiss scientists are here at the invitation of the American-Swiss Foundation for Scientific Exchange—an organization founded to tie together again the scientific bonds of the two countries, severed during the war years, by fostering visits of scientists of one country to the other. The American Cancer Society also participated in the invitation to Drs. Ruzicka and Reichstein to visit our country because of their extensive knowledge of steroids—organic chemical substances which may play an important role in solving some of the mysteries of cancer.

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Institute of Optics
University of Rochester

Gifts totaling $150,000 from the Eastman Kodak Company and the Bausch and Lomb Optical Company will support new developments in teaching and research at the Institute of Optics, University of Rochester, it was announced March 15. A part of the program includes the appointment of Brian O'Brien, Ph.D., to the newly created post of research professor of physics and optics, the first research professorship at the university. The enlarged program of the Institute of Optics is in addition to the plans for expanding the department of physics, announced March 14, for which $550,000 has been appropriated by the university for additions to building and equipment for the department. The two programs in physics and optics will be coordinated under the administrative direction of Lee A. DuBridge, Ph.D., professor and chairman of the physics department. Dr. O'Brien, who has been director of the institute since 1938, will devote most of his time to important research projects. He joined the university staff in 1930 as professor of physiologic optics. The new funds for the Institute of Optics were given by the Eastman Kodak Company under a 1945 contribution of $100,000 and by the Bausch and Lomb Optical Company, which is providing $50,000. Both companies assisted in founding the institute in 1929 with financial support and technical assistance. In 1934 the university assumed entire financial responsibility, but Eastman Kodak and Bausch and Lomb continued their interest by having representatives on the board of advisers. The institute is said to be the only one of its kind in this country and one of the few in the world offering work in optics which approaches in scope and completeness that given at the university.

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Passano Foundation Award

Selection of Dr. Ernest W. Goodpasture, professor of pathology and dean of the School of Medicine of Vanderbilt University, Nashville, Tennessee, as the 1946 recipient of the Passano Foundation Award is announced by the Board of Directors of the Foundation. Presentation of the $5,000 cash award will be made at an appropriate ceremony in historic Osler Hall of the Medical and Chirurgical Faculty of Maryland, in Baltimore, on the night of May 15th.

The Foundation, which was established in 1944 by the Williams and Wilkins Company, Medical Publishers, of Baltimore, proposes to aid in any way possible the advancement of medical re-

search, especially research that bears promise of clinical application. For the encouragement of such research the Foundation has established the award as one of its activities.

Dr. Emil Novak, associate in gynecology in the Johns Hopkins University Medical School; Dr. Nicholson J. Eastman, professor of obstetrics in the Johns Hopkins University Medical School; Dr. George W. Corner, director of the Embryological Laboratory of the Carnegie Institution of Washington, represent the medical profession on the Board of Directors of the Foundation.

Following the presentation of the award by Mr. Edward B. Passano, chairman of the board of the Williams & Wilkins Company, Dr. Goodpasture will deliver an address entitled, "Research and Medical Practice."

Dr. Goodpasture receives the award for his original development of the method for propagation of viruses in pure culture by inoculation of chick embryos and for his outstanding contributions to advancement of knowledge of the cell-parasite relationship in bacterial and virus infection.

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Fellowship in Diabetes

The New York Diabetes Association offers a fellowship for the study of diabetes mellitus at a salary of $150 a month for a period of six months. This fellowship consists in training a doctor in the treatment of diabetes in both clinical and laboratory work during the months of May and June, having him act as resident for the diabetic children's camp of the association during July and August (when he would receive his board and lodging), and devote his time in September and October to the writing up of the results of treatment at the diabetes camp, which, if sufficiently meritorious, would be recommended for publication. The preliminary training would take place under the auspices of various recognized specialists in diabetes in Greater New York. Applications, stating qualifications, should be made in writing as soon as possible to Dr. Herman O. Mosenthal, 889 Lexington Avenue, New York 21.

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Hematology Research Foundation

The Hematology Research Foundation invites applications for the Ruth Reader Fellowship for research in blood diseases. The value of this Fellowship is $1,500 for one year. It is offered to workers of any race or creed in America. Applications must be submitted no later than June 1st, next, to Dr. Ludvig Hektoen, 21 W. Elm Street, Chicago, Illinois, the chairman of the Medical Advisory Council for the Foundation. The Council will choose the applicant and the institution in Chicago, in which the work is to be done, on the basis of merit.

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Journal of the History of Medicine and Allied Sciences

This new publication is a quarterly published by Henry Schuman, New York. Price, $7.50. It will be devoted to medicine and allied fields. The first number presents many interesting papers, such as "Medical Education in 17th Century England."

Book News

Clinical Electrocardiography

By David Scherf, M.D., Associate Professor of Medicine, and Linn J. Boyd, M.D., Professor of Medicine, New York Medical College. Ed. 2. J. B. Lippincott Company, Philadelphia. 1945. Price, $8.

An aid to clarifying the mysteries of the electrogram as a means of making a better diagnosis in heart conditions. The several hundred illustrations will help to give the tyro a better idea of what's what in electrocardiography than most texts do.

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Motor Disorders in Nervous Diseases

By Ernest Herz, M.D., instructor in neurology, and Tracy J. Putman, M.D., professor of neurology and neurological surgery, College of Physicians and Surgeons, Columbia University. King's Crown Press, New York. 1946. Price, $3.

This introduction to clinical neurology follows the outline used at the Neurological Institute, New York, in the arranagement of the material which gives a detailed description on the various motor phenomena and instructions in methods of examination. Each group of phenomena is approached from a physiologic or anatomic structural discussion of underlying factors.

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Synopsis of Physiology

By Rolland J. Main, Ph.D., Professor of Physiology, Medical College of Virginia. The C. V. Mosby Company, St. Louis. 1946. Price, $3.50.

A review or refresher book. Covers the high spots of physiology, with adequate fundamental material and incorporating advances in the subject. Restricted to human physiology.

Brief mention of some physiologic disturbances is made to emphasize the contrast of normal and abnormal. Relative space devoted to the various subjects is determined by their complexity, clinical interest and importance and recency.

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The Venous Pulse and Its Graphic Recording

By Franz M. Groedel, M.D., Cardiologist, Beth David (and other) Hospital. Brooklyn Medical Press, New York. 1946. Price, $5.50.

Discusses the phlebogram and stresses the importance of a careful study of the venous blood stream. Depicts and analyzes 290 phlebograms.

War Neuroses

By Roy R. Grinker, Lt. Col., M.C., and John P. Spiegel, Major, M.C., Army Air Forces. The Blakiston Company, Philadelphia. 1945. Price, $2.75.

Full discussion of these neuroses with case reports and conclusions based on observation of hundreds of patients among American and British troops. The case histories, demonstrating typical methods of dealing with anxiety, which is the central core of all neuroses, will serve as a good text for students of human personality and human psychopathology.

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Essentials of Human Embryology

By Gideon S. Dodds, Ph.D., Professor of Histology and Embryology, School of Medicine, West Virginia University. Ed. 3. John Wiley & Sons, Inc., New York. 1945. Price, $4.

This edition retains the plan and aims of the earlier versions, but incorporates material covering the most recent advances in embryological knowledge. A new chapter on human development has been added, presenting a direct account of development based on increasingly adequate human material and supplemented by recent and excellent work on monkeys. Other sections which have been extensively revised are those dealing with the fetal membranes, the early mesoderm, the respiratory organs, the body cavities, the blood vascular system, the lymphatics, the reproductive organs, and the organs of special sense.

Medical students will find this book very useful and informative.

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Physical Chemistry for Premedical Students

By John Paige Amsden, Professor of Chemistry, Dartmouth College. McGraw-Hill Book Co., Inc., New York. 1946. Price, $3.75.

This text was written especially for a one-semester course for premedical students. It includes only those portions of elementary physical chemistry which will be of value to the medical student in his later professional work. Worked-out problems illustrate each topic treated. Throughout the text the Brönsted concept of acids and bases has been used consistently. Many lecture demonstrations are described. The mathematical requirements have been kept to a minimum. One of the features of the book is the list of visual aids—motion pictures and film strips —correlated with the material in the book.

Preventive Medicine and Public Health

By Wilson G. Smillie, M.D., Professor of Public Health and Preventive Medicine, Cornell University Medical College. The Macmillan Company, New York. 1946. Price, $6.

This book presents a new point of view in medical education, namely, that preventive medicine is an essential part of the practice of clinical medicine. Material presented is drawn from clinical experience, and illustrated by actual case histories. This text departs from previous ones in the fact that it gives limited consideration to matters formerly presented extensively in hygiene courses. It does not discuss to any great extent sanitary engineering features of public health procedures. Its primary emphasis is on the importance of the practicing physician in the promotion of individual, family and community health. A section of special interest is a discussion of "adequacy of medical care." It illustrates the influence of social and economic factors on health promotion.

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Applied Physiology

By Samson Wright, M.D., John Astor Professor of Physiology, University of London, Middlesex Hospital Medical School. Ed. 8. Oxford University Press, London. 1945. Price, $9.

Completely revised with the addition of several hundred new illustrations.

Shock Treatments and Other Somatic Procedures in Psychiatry

By Lothar B. Kalinowsky, M.D., Research Associate in Psychiatry, and Paul H. Hoch, M.D., Instructor in Psychiatry, Columbia University College of Physicians and Surgeons. Foreword by Nolan D. C. Lewis, M.D., Professor of Psychiatry, Columbia University College of Physicians and Surgeons. Grune & Stratton, New York. 1946. Price, $4.50.

This book gives the first full and systematic account of the various forms of organic treatment in psychiatry based on extensive experience and research. Starting with an historical development of these types of treatment, the authors present the theoretical structure and the facts of procedure and results accruing from their experience in the clinic and the laboratory.

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The Diagnosis of Nervous Diseases

By Sir James Purvis-Stewart, M.D., Consulting Physician to Westminster Hospital. Ed. 9. The Williams and Wilkins Company, Baltimore. 1945. Price, $11.

Very complete; well written; profusely illustrated. A good book for the student as well as for the practitioner.

New (3d) Edition — Just Ready

THE AUTONOMIC NERVOUS SYSTEM

By Albert Kuntz, Ph.D., M.D.
Professor of Micro-anatomy in St. Louis University School of Medicine, St. Louis, Missouri.

Octavo, 687 pages, illustrated with 91 engravings. Cloth, $8.50.

This thoroughly revised edition incorporates the many new findings which have been obtained from experimental and clinical studies. They have extended our knowledge and have clarified both the normal activity of the autonomic nerves and their modified activity in the presence of disease. To include this new material the entire text has been revised and in part reorganized and rewritten.

New (4th) Edition — Just Ready

A TEXT BOOK OF NEURO-ANATOMY

By Albert Kuntz, Ph.D., M.D.

Octavo, 478 pages, illustrated with 325 engravings. Cloth, $6.50.

This work presents in a clear, concise but comprehensive manner the fundamental facts of the anatomy and physiology of the nervous system which are necessary for the understanding of human behavior. In its present form this volume clarifies a subject which is too often obscured by details. It reduces to a minimum the difficulties which the student encounters. The book makes the fundamental plan and structure of the vertebrate nervous system relatively simple.

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